University of Derby

Influencing Attitudes, Changing Behaviours and Embedding a Pro-sustainability Mindset in the Workplace

An Innovation Diffusion Approach to Persuasive Communications

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Preface

This thesis is submitted to the University of Derby in partial fulfilment of the requirements for the degree of Doctor of Philosophy. This research was carried out under the supervision of Prof. Jose Arturo Garza-Reyes and Prof. Ming Lim. To the best of the author's knowledge, this work is original and has not been submitted for any other award or at any other university. An ethical approval was acquired prior to the commencement of the empirical investigations.

Abstract

Although several sustainability implementation frameworks have been proposed, researchers have not yet proposed theories or models to help organisations speed up the rate of sustainability diffusion and narrow the gap between what is known and what is put into use. This study sought to fill this gap by proposing a sustainability diffusion model. The model was developed from an exhaustive review of the corresponding literature. It uses Rogers' (1962) diffusion of innovations theory and Ajzen's (1991) theory of planned behaviour as a theoretical foundation. The model was tested and its structural architecture was validated in three different sustainability contexts; namely, duplex printing in UK universities; sustainable computing in service-based businesses; and sustainability culture in UK universities. The primary data was analysed statistically using SPSS, and structural equation modelling (SEM) in particular was used to validate the structural architecture of the proposed model.

The SEM results indicate that the structural architecture of the theory of planned behaviour is well-founded. All the hypotheses that underline the theory's paths were supported. In contrast, the structural architecture of the diffusion of innovations theory was weakly supported. Some of the paths were rejected in at least two occasions. For example, the relationship between pro-sustainability knowledge and attitude was neither statistically significant nor directional. Moreover, several components of the 'verified' model turned out to be statistically insignificant or were rejected altogether. These were knowledge, perceived self interest, perceived persuader legitimacy, perceived consequences, perceived argument quality, trialability and perceived source credibility. Accordingly, once these constructs were removed and the model was restructured in accordance with the results of SEM analysis, an entirely new version of the 'sustainability diffusion model' emerged (*See* Figure IX-2). The architecture of the new model suggests that in order to speed up the rate of sustainability diffusion, change agents must emphasise the relative advantage, compatibility, subjective norm and the urgency of the pro-sustainability initiative under implementation and de-emphasise any complexities or risks associated with its operationalisation.

Unexpectedly, the new version of the proposed model relies more on Ajzen's (1991) theory of planned behaviour as a theoretical foundation than on Rogers' (1983) innovation-decision process model. In other words, the new model maintained almost all the features of the theory of planned behaviour, but it only absorbed some, but not all, of the components of Rogers' innovation-decision process model. Nevertheless, the new model maintained its holistic nature. It still takes into account both the person-specific and innovation-specific factors that influence the diffusion, adoption and actualisation of pro-sustainability behaviours/initiatives.

Dissemination of Research

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Chapter I

Introduction

1.1 Research Background

Sustainability has received a lot of attention in recent years from both academics and practitioners (Jansson et al., 2017). This is evidenced by the surge in the number of publications in the sustainability area of research. Increased competitiveness in the global marketplace has encouraged companies of all kinds and sizes to embrace sustainability and integrate the principles of sustainable development into their corporate strategies in an attempt to enhance their long-term competitiveness (Dias, 2017). Sustainability today is considered to be a key strategic priority and a means by which organisations confront the challenges in their competitive environments (Flint and Golicic, 2009). It is believed to help organisations deal with complex challenges in relation to their operational efficiency, social responsibility and the environmental friendliness of their products and services (Mejías et al., 2016). Sustainability also helps organisations strengthen their brand value (Miller and Merrilees, 2013), improve productivity, reduce costs and increase exploitation of new market opportunities (Sezer, 2015).

Due to the credible benefits of sustainability, the past decade has witnessed a significant shift in organisations' perception of sustainability. Sustainability is no longer seen as an added cost, but rather as an important source of sustainable competitive advantages (Markley and Davis, 2007). Hence, the focus of sustainability research has recently shifted towards implementation and how organisations should handle the barriers and challenges associated with the adoption and operationalisation of pro-sustainability initiatives/behaviours (e.g. Bowen et al., 2017).

Although the technical issues of sustainability have been widely researched, there have been fewer research studies that investigate how sustainability principles are embedded into organisations' cultures and employees' mindset. It remains unclear how sustainability can be operationalised at the organisational and behavioural levels. Some researchers believe that sustainability requires a radical behavioural change in order to create a new system of beliefs and new ways of thinking (e.g. Coskun et al., 2015), while others believe that sustainability implementation is an incremental process that only requires moderate behavioural changes and incremental improvements in organisations' reward systems, processes, policies and procedures (e.g. Weaver, 2012; Szekely and Strebel, 2013).

The diffusion, adoption and implementation of pro-sustainability initiatives are not always straightforward. There is a high probability of failure (Downey, 2004). Organisations face a

diverse range of challenges, some of which are technical, while others are organisational or behavioural in nature. Burnes (2003) stated that between 40 and 70 per cent of change initiatives fail. The failure of these initiatives is not always attributed to the initiative itself, but rather to an implementation failure (Klein and Knight, 2005).

Arguably, it is not the technical side of sustainability that determines the success or failure of its implementation. It is, in fact, the human element of the implementation process that has the greatest impact on the implementation's success. Not all organisations succeed in sustainability implementation, even if they adopt exactly the same tools and practices, because sustainability is a system and systems are operated by people. Hence, if the employees do not have favourable perceptions of the new system and do not have favourable attitudes towards its diffusion and actualisation, the system will almost certainly fail.

The implementation of sustainability might also be hindered by several other barriers. These barriers differ from one organisation to another, depending on the organisation's size, industrial rivalry, availability of resources and experience. The most common barriers to sustainability implementation include lack of top management commitment (Setthasakko, 2009), conflicting priorities (Galuppo et al., 2014), time pressure, lack of awareness, concerns about the quality of sustainable goods, resistant organisational cultures (Hoover and Harder, 2015) and lack of suppliers' commitment to sustainability (Bhanot et al., 2017). Lack of top management support for sustainability initiatives is considered a major barrier to sustainability implementation because it sends the wrong signals to staff in relation to the organisation's commitment to the successful implementation of the new initiatives, which in turn leads to several behavioural implications such as organisational resistance (Setthasakko, 2009).

Moreover, sustainability requires organisations to actively engage with stakeholders and to take the necessary actions to meet their needs and expectations. However, stakeholders sometimes have conflicting priorities, leaving companies in a dilemma as to whose needs and expectations should be fulfilled first (Galuppo et al., 2014). For example, shareholders expect companies to focus on the maximisation of their economic gains, while consumers and local communities expect firms to focus more on environmental and social initiatives and less on economic gains. Therefore, organisations have to find a way to optimally manage the trade-offs between the economic, social and environmental pillars of sustainability (Haggar et al., 2017). However, managing these trade-offs may prove very challenging for some companies.

1.2 Research Gap

Today, the diffusion of more sustainable workplace practices has become a moral obligation. However, getting people to adopt pro-sustainability initiatives is often very difficult, even when they have obvious advantages. Unfortunately, there is still a wide gap in the field of sustainability, between theory and practice. Sustainability scholars have not yet sufficiently addressed this issue. In fact, the number of theoretically-grounded sustainability implementation models, theories and frameworks is alarmingly insufficient, despite the rapid growth in the number of empirical studies that investigate sustainability and the implications of its adoption and implementation (Carter and Easton, 2011). Many empirical studies appear to have failed to make a strong theoretical contribution. Hence, this particular area of research remains significantly underdeveloped (Hoejmose and Adrien-Kirby, 2012).

Although there have been few attempts by researchers from different disciplines to advance theory building in the area of sustainability implementation, many of the proposed models and frameworks have little to offer on understanding how employees' perceptions of, and attitudes towards sustainability can be better managed in order to speed up the rate of its diffusion. Sustainability is a system and systems are operated by people. Thus, unless the people embrace the system, it will neither be adopted nor operated effectively.

One of the least understood areas of sustainability implementation is non-adoption. The question of how organisations can favourably influence the perceptions, attitudes and behavioural intentions of their workers, and speed up the rate by which pro-sustainability initiatives are diffused remains unanswered. Hence, this research set out to develop a sustainability diffusion model (SDM). It analysed the different forms of innovation and established the link between sustainability and organisational innovation. It also drew on the existing theories in the research fields of persuasive communication and innovation diffusion to help understand the issues that were believed to be central to sustainability diffusion. This research went beyond the analysis of individuals' and organisations' motives for sustainability diffusion towards an improved understanding of how workers' attitudes and perceptions of pro-sustainability initiatives/behaviours impact upon the rate by which they are diffused and influence the process of their adoption and actualisation.

1.3 Aim and Objectives

This research study aimed to:

- Develop, verify and validate a Sustainability Diffusion Model (SDM).

In order to realise this aim, the following objectives had to be successfully achieved:

1. To conduct an in-depth review of sustainability implementation literature; innovation diffusion literature; persuasive communication literature; and other, relevant areas of research and to develop a strong and robust theoretical foundation for the SDM.
2. To establish conceptual links between sustainability and innovation and argue for the applicability of Rogers' (1962) diffusion of innovations theory to sustainability.
3. To evaluate the feasibility and theoretical viability of incorporating Ajzen's (1991) theory of planned behaviour into Rogers' (1962, 1995, 2003) innovation-decision process model to create an architectural foundation for the SDM.
4. To identify the behavioural factors which may, directly or indirectly, support or hinder the diffusion of pro-sustainability initiatives/behaviours.
5. To develop a conceptual sustainability diffusion model that incorporates the factors identified in Objective No. 4.
6. To verify the conceptual Sustainability Diffusion Model (SDM).
7. To validate the proposed SDM using the scenarios of three different pro-sustainability behaviours, namely: duplex printing in UK universities; sustainable computing in the workplace; and culture of sustainability in UK universities.

1.4 Research Questions

This research set out to answer the following research questions:

1. Is sustainability an innovation, a driver of innovations, both an innovation and driver of innovations, or has nothing to do with innovation whatsoever?
2. What are the definitional characteristics shared between sustainability and innovation?
3. If sustainability is an innovation, what type of innovation is it?
4. Is it justifiable to use Rogers' (1983) innovation-decision process model to help understand the factors that influence the rate of sustainability diffusion?
5. Is it theoretically and conceptually feasible to incorporate Ajzen's (1991) theory of planned behaviour into Rogers' innovation-decision process model to help us capture both, the person-specific and innovation-specific factors that impact upon the diffusion rate and adoption processes of pro-sustainability initiatives/behaviours?
6. What are the behavioural factors that support or hinder the diffusion of sustainability?

1.5 Academic Contributions

This thesis makes several academic contributions to the research fields of innovation diffusion; workplace psychology; behavioural management; change management and persuasion. These contributions include, but are not limited to:

1. Filling a Gap in the Sustainability Implementation Literature

The existing theories have little to offer on how employees' perceptions and attitudes towards sustainability can be better managed to increase the rate of its diffusion and enhance the success probability of its adoption and implementation. This research fills this gap by identifying some of the factors that influence employees' perceptions, attitudes and their willingness to embrace and actualise pro-sustainability behaviours in the workplace.

2. Establishing a Conceptual Link between Sustainability and Organisational Innovation

This study is one of very few studies, if not the only study that conceptualises sustainability as an organisational innovation. The sustainability literature often discusses sustainability as a driver of innovation (e.g. Sarkar and Pansera, 2017) or as an outcome of an innovation process (i.e. eco products and services and sustainable business models), but there have not been any attempts to link the two concepts as theoretical constructs.

3. Using Rogers' (1962) Diffusion of Innovations Theory as a Theoretical Foundation

There have not been any attempts in the academic literature to apply Rogers' (1962) diffusion of innovations theory to sustainability holistically, even though there are few studies that use Rogers' innovation attributes to determine the predictors of pro-sustainability innovations' adoption. The establishment of a conceptual link between sustainability and organisational innovation meant that Rogers' theory could be justifiably applied to sustainability to help understand and/or explain the factors that influence the diffusion, adoption and implementation processes of pro-sustainability practices/behaviours.

4. Incorporating Ajzen's (1991) Theory of Planned Behaviour into Rogers (1983) Model

This study is one of very few studies, if not the only study that argues in favour of incorporating Ajzen's (1991) theory of planned behaviour (TPB) into Rogers' (1983) innovation-decision process model. The arguments put forth in this thesis are both conceptual and empirical. Conceptually, the TPB is believed to be very compatible with the scope and conceptual arguments of Rogers' (1962) theory. In fact, the TPB fits very well into persuasion and decision stages of Rogers' innovation-decision process model.

5. Extending Rogers' (1983) Model and Ajzen's (1991) TPB

This research simultaneously extended Rogers' (1983) innovation-decision process model and Ajzen's (1991) theory of planned behaviour. Incorporating Ajzen's (1991) TPB into Rogers' (1983) model constitutes a major extension to the diffusion of innovations theory. Similarly, merging Ajzen's theory with Rogers' innovation-decision process model represents a significant extension to the TPB. Besides, 8 new variables were incorporated into the 'combined' model, namely: perceived source credibility; perceived argument quality; perceived self-interest; perceived consequences; perceived urgency of change; perceived persuader legitimacy; perceived risk; and communicability. Each of these variables was believed to influence the outcome of the sustainability-diffusion decision process.

6. Studying the Rate of Diffusion in the Context of Sustainability

This research may be the only empirical study that investigates the factors that impact on the rate by which pro-sustainability behaviours/initiatives are diffused. The element of time is rarely considered in sustainability research. Besides, there are very few empirical studies that explore the relationship between innovative behaviour on the one hand and attitude, intention, behaviour, adoption and diffusion rate on the other hand, in the context of sustainability.

7. Improving Our Understanding of the Mediation Effects of Attitude and Intention

This research's findings are distinctively unique in the sense that there are not many studies, if any at all, that investigate the mediation effects of attitude on the relationship between knowledge, relative advantage, compatibility, risk, observability, communicability and trialability on the one hand and on behavioural intention on the other hand. Also, there are not any studies that investigate the mediation effects of attitude on the relationship between observability and later adoption, even though there are hundreds of studies that examine the relationship between attitude and behavioural intention in the context of the environment. Additionally, no empirical investigations were found to examine the mediation effects of intention between perceived self-interest and behaviour; or between perceived self-interest and adoption; or between perceived self-interest and later adoption.

8. Testing Ajzen's (1991) Theory and Rogers' (1983) Model in Different Scenarios

This research empirically tested Ajzen's (1991) theory of planned behaviour and Rogers' (1983) innovation-decision process model in 3 different, pro-sustainability scenarios, namely: duplex printing; sustainability computing; and sustainability mindset. It empirically validated the interdependent relationships that exist between the different components of Ajzen's theory, using structural equation modelling and also confirmed the hypotheses that underlie these

relationships. Similarly, Rogers' innovation attributes were thoroughly tested and their impact on different stages of the diffusion process was also validated using SEM.

9. Understanding the Diffusion of Sustainability Mindset in UK Universities

Another characteristic that makes this research distinctively unique is that one of the validation studies investigated the diffusion of sustainability culture/mindset, which is an intangible innovation. The study investigated employees' perceptions and attitudes towards sustainability as a lifestyle philosophy and as a workplace mindset. There are not any empirical studies in the sustainability literature that conceptualise sustainability as a workplace mindset. Often, scholars study the adoption of pro-environmental behaviours, but they rarely investigate the adoption of sustainability itself as an umbrella concept/philosophy/culture.

1.6 Structure of the Thesis

This thesis is made up of 10 chapters, as follows:

- **Chapter I: Introduction**

This chapter provides an overview of the subjects under investigation. It highlights the current gaps in the sustainability literature and explains the rationale behind this research.

- **Chapter II: Literature Review on Sustainability**

This chapter provides a concise review of the sustainability literature. It begins with a general discussion about the evolution of sustainability theories and then moves on to discuss the factors that influence sustainability implementation. The second part of this chapter reviews the literature on pro-sustainability behaviour in the workplace in general and in universities in particular. The chapter ends with an overview of the current gaps in the sustainability implementation literature.

- **Chapter III: Literature Review on Innovation Diffusion**

This chapter provides a comprehensive overview of the innovation diffusion literature and attempts to highlight the primary areas of disagreement, continued debate and inconsistency. It begins with a conceptualisation of innovation and then discusses the difference between invention and innovation; the defining attributes of innovation; the perceived attributes of innovation; the process of innovation diffusion; and the theories and models of innovation diffusion. It critically evaluates several innovation diffusion theories and models that are believed to relevant to this research, namely: Rogers (1962) diffusion of innovations theory; Davis (1989) technology acceptance model; Venkatesh et al. (2003) unified theory of acceptance; Tornatzky and Fleischer (1990) technology organisation environment; Cooper and

Zmud (1990) six-stage model of implementation; DeLone and McLean (2003) information system's success model; Bass (1969) model of diffusion; Bagozzi and Lee (1999) innovations' resistance and acceptance model; Kleijnen et al. (2009) innovation resistance hierarchy; Ram (1987) innovation resistance model; Klein and Sorra (1996) innovation implementation effectiveness model; and Nolan (1993) institutional adoption of innovations model.

- **Chapter IV: Literature Review on Persuasive Communication**

This chapter presents an overview of the different models and theories that conceptualise persuasion and the factors that influence people's attitudes, intentions and ultimately their behaviours. The chapter begins with an overview of persuasion and then moves on to discuss the relationship between attitude on one hand and persuasion, behavioural intention and the actualisation of behaviours on the other hand. It also evaluates a number of persuasion theories that are believed to be relevant to this research, namely: the elaboration likelihood model; the cognitive dissonance theory; the heuristic-systematic model; the theory of attribution; theories of social influence; and the theory of planned behaviour.

- **Chapter V: Conceptual Sustainability Diffusion Model Development**

This chapter facilitates the development of a greater understanding of sustainability diffusion. It analyses the different forms of innovation and establishes conceptual links between sustainability and organisational innovation. It highlights the theoretical concepts that are relevant to the research's aim and to the subjects under investigation. It also draws on the existing theories in the fields of innovation diffusion to help understand the issues that are central to sustainability adoption. Moreover, this chapter demonstrates how Ajzen's (1991) theory of planned behaviour and Rogers' (1962) diffusion of innovations theory were used as a theoretical foundation and how they helped the author to identify the behavioural factors that have a significant impact on the rate of sustainability diffusion. It also illustrates how the identified factors were incorporated into Rogers' (2003) innovation-decision process model to produce a "sustainability diffusion model".

- **Chapter VI: Research Methodology**

This chapter presents the methodological approach that was adopted to achieve the study's aim and objectives. It outlines the research's philosophy, design and the methods used to collect, analyse and interpret the primary data. It also provides an overview of how the research's hypotheses were tested; how the measurements were operationalised, and what issues were taken into consideration when designing and conducting the empirical investigations.

- **Chapter VII: Verification of Proposed Sustainability Diffusion Model**

This chapter presents the outcomes of a survey study whose aim was to verify the research hypotheses put forth in Chapter VI, and to improve the structural architecture of the initial 'sustainability diffusion model'. It demonstrates how the opinions, feedback, comments and constructive criticism of sustainability experts were used to improve the conceptual model and produce a much more robust and practical model.

- **Chapter VIII: Validation of Proposed Sustainability Diffusion Model**

This chapter analyses and interprets the data collected for three separate empirical investigations, namely: the diffusion of duplex printing; the diffusion of sustainable computing; and the diffusion of sustainability culture. The three investigations sought to empirically test the research hypotheses put forth in Chapter VI, and to validate the structural architecture of the proposed 'sustainability diffusion model'.

- **Chapter IX: Discussion**

This chapter discusses the results of this research in relation to the academic literature and sheds some light on the areas of similarity and/or difference between the findings of this study and those of other scholars who may have investigated similar research problems. It also highlights how the research hypotheses were tested and how the components of the proposed sustainability diffusion model were validated. It explains why some of the proposed research hypotheses turned out to be statistically insignificant or were rejected altogether.

- **Chapter X: Conclusion**

This chapter demonstrates how the research's aim has been achieved successfully. It discusses the research's contribution to knowledge and the theoretical and practical implications of its findings. It also highlights the research's limitations and future research opportunities.

Chapter II

Literature Review on Sustainability

2.1 Introduction

This research aimed to develop a sustainability diffusion model. In order to achieve this aim, a comprehensive review of relevant academic literature had to be conducted. The purpose of the review was threefold. Firstly, a review of sustainability implementation literature was needed in order to get the author familiar with the subjects under investigation; put the research into context; and highlight the current gaps in the literature and how this research would add value to the existing body of knowledge. Secondly, a review of innovation diffusion literature was necessary in order to identify existing theories, models or frameworks that could be used to explain and conceptualise the process of sustainability diffusion. Thirdly, it was necessary to review the literature on the subject of persuasion in order to identify the behavioural factors that have an impact on the diffusion of pro-sustainability initiatives/behaviours.

This chapter only satisfies the first part of a three-part literature review. It provides a concise review of the sustainability literature. It begins with a general discussion about the evolution of sustainability theories and then moves on to discuss the factors that influence sustainability implementation. It also highlights the implementation models and frameworks that have been developed by other scholars. The second part reviews the literature on pro-sustainability behaviour in the workplace, in general, and in universities in particular. It ends with an overview of the current gaps in the sustainability implementation literature. It argues that although sustainability research has become prominent in recent years, there is still a wide gap between what is known and what is put into practice, and that the number of theoretically-grounded sustainability implementation theories remains alarmingly insufficient.

2.2 What Is Sustainability?

The concept of sustainability is ambiguous and controversial. There is lack of consensus in the literature about the exact meaning of sustainability. Its definition differs from one discipline to another and from one scholar to the other. The most commonly quoted definition is that of Brundtland Commission of the United Nations which defines sustainable development as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 3). A few scholars find this definition to be appealing, while others consider it to be ambiguous and vague. It does not give specifics nor does it outline the criteria that clarify what it means to be sustainable. On one hand, this

may be perceived positively in the sense that organisations can customise their approach to sustainability to meet their specific needs and the expectations of their stakeholders (White, 2013). O'Riordan (1995; p. 21) argued that the ambiguity of sustainability allowed it to "transcend the tensions inherent in its meaning". Mitchell (1997; p. 28) also considered sustainable development to be "an intuitively attractive but a slippery concept".

On the other hand, the vagueness and ambiguity of concept impacts negatively on the diffusion rate of pro-sustainability innovations. Besides, the WCED's definition contains a conceptual flaw. It attends first to the needs of present generations which are irrelevant to sustainability and then attends to the needs of future generations which are the cornerstones of sustainability. This conceptual flaw sets the stage for intergenerational conflict and a win-lose situation whereby the present generation's needs are prioritised over future generations'.

Kates et al. (2005) conducted a thorough analysis of the original Brundtland definition and identified three crucial elements of sustainability, namely: nature, life support systems and community. Similarly, Costanza and Patten (1995) found that most sustainability definitions contained elements of equitable distribution, sustainable scale and efficient allocation of natural resources. This was supported by McMichael et al. (2003) who defined sustainability as a "means of transforming our ways of living to maximize the chances that environmental and social conditions will indefinitely support human security, well-being and health".

Although it is unlikely that a mutually-agreeable, succinct definition of sustainability will emerge anytime soon in the academic or practitioner literature, there is an agreement that sustainability calls for the integration of social, ecological and economic factors into organisations' decision-making processes (Gallopin, 1996; Wilson, 2015; Dixon and Clifford, 2007). The social element of sustainability is concerned with the satisfaction of basic human needs such as the continued availability of food, water, shelter and other secondary necessities such as employment, education, freedom and security (Lautensach and Lautensach, 2010).

The ecological element of sustainability is concerned with the preservation of the productivity and functionality of the planet's ecosystems. It focuses on the conservation of biological diversity, and on the protection of non-renewable, natural resources (Bansal, 2003; Darnall et al., 2008). However, the economic element is more elusive. There is a tendency for economists to overlook the limitations of ecosystems and assume the inevitability of economic growth. This tendency is inconsistent with the core principles of sustainable development. Economic sustainability seeks to constrain the consumption of non-renewable resources, but maintains a healthy economic growth in order to create a sustainable society in which the unquantifiable

values of ecosystems are adequately considered (Ehrenfeld, 1976; Nijkamp and Soeteman, 1988). It encourages organisations to reconcile their economic interests with their social and environmental obligations in search of an inclusive and equitable human development (Osorio et al., 2005; Balbinot and Borim-de-Souza, 2012).

The tri-dimensional/triple-bottom-line view of sustainability emphasises the interdependence of the social, ecological and economic aspects of sustainable development (Gladwin et al., 1995; Yeh and Chuang, 2011; Buyukozkan and Cidci, 2012). In other words, an organisation will only become truly sustainable when it reaches a balance between the three pillars of sustainable development - a balance that equates the level of attention each dimension of sustainability receives from an organisation's leadership.

2.3 Evolution of Sustainability Theories

This part of the review provides an insight into the evolution of sustainable development theories. It discusses the evolution of five fields of research, namely: green economy (GE); circular economy (CE); corporate sustainability (CS); stakeholder theory (ST); and corporate social responsibility (CSR). There are, of course, other theories that may be directly or indirectly related to sustainable development or to the evolution of sustainability research, but only the aforementioned theories are believed to be relevant to the context of this research.

2.3.1 Corporate Social Responsibility (CSR)

Sustainability, as behaviour, can be traced back to as early as humans learned how to sustain their livelihoods as individuals, groups or communities. However, as a business concept, sustainability surfaced in the 1930s when social responsibility started to become important (Carroll, 1999). As a research concept, sustainability was first theorised in 1953 by Howard Bowen in his famous book, titled "Social Responsibilities of the Businessman". Bowen suggested that companies are the centre of power and they have a significant influence on the livelihoods of local citizens. Hence, they should seek to engage in activities that make a contribution to society and must refrain from pursuing policies, decisions or actions whose outcome will have an undesirable impact on citizens or the society as a whole. The concept of 'social responsibility of businessmen' gained momentum in the 1960s, but not without critics. The most influential critic was Milton Friedman who argued that the primary and only responsibility of a firm is to maximise shareholders' return on investments (Orlitzky, 2015). Friedman claimed that Bowen's philosophy of socially responsible corporations threatens the capitalist philosophy of "free marketplace" and "free enterprise society" (Friedman, 1962).

Despite the efforts of the critics, Bowen's ideas continued to gain interest and support from scholars. In the 1970s, the concept of CSR was rationalised and scholars began to discuss the potential links between CSR and firms' social support structure and long-term performance (e.g. Balabanis et al., 1998). These links continue to be of interest to business scholars to this very day, but they are studied under new banners such as 'social sustainability' (e.g. Ameer and Othman, 2017; Abbasi, 2017). Gradually, the conceptual scope of CSR widened to include discretionary responsibilities (Whitfield and Dioko, 2011); ethical responsibilities (Charbaji, 2009); legal responsibilities (Voiculescu, 2011); and economic responsibilities (Prout, 2006).

Today, one of the most popular areas of research with regards to CSR is the relationship between CSR initiatives and companies' economic performance (e.g. Park et al., 2017; Amini and Bianco, 2017). It appears that scholars are convinced of the positive relationship between CSR and firms' performance; therefore, they are trying to confirm this relationship empirically (e.g. Alikaj et al., 2017). The common argument put forth by CSR scholars is that businesses will benefit greatly from having good public relations, untarnished reputation and the support of local communities (Lee, 2016). These are considered the essential ingredients for firms to be able to retain existing customers (Pérez and del Bosque, 2015), attract new customers (Liu et al., 2014) and more importantly acquire investment capital (Cajias et al., 2014).

2.3.2 Stakeholder Theory (ST)

ST was first introduced in the early 1980s by Edward Freeman who conceptualised the nature of the relationship between corporations and their stakeholders (Freeman, 1984). The theory argued that companies should not only attend to their traditional stakeholders such as employees, suppliers and customers, but also to their non-traditional stakeholders such as NGOs and members of local communities who have a direct or indirect influence on their operations. Freeman (1984: p. 46) defined stakeholders as "any group or individual who can affect or is affected by the achievement of the organisation's objectives". ST suggests that "firms are actors in the social environment and thus should respond to pressures and demands from their stakeholders, to achieve their strategic objectives" (Linnenluecke and Griffiths, 2013). Freeman divided stakeholders into two main categories, namely: primary stakeholders and secondary stakeholders (Freeman, 1984). The primary stakeholders have a much greater and a more direct impact on companies' operations and business performance than the secondary stakeholders (Jackson, 2001). Customers are an example of primary stakeholders, whereas environmental activists are an example of secondary stakeholders.

Originally, the argument of ST focused primarily on social stakeholders, but this has begun to change recently as scholarly discussions continue to focus more on environmental issues (e.g.

Theodoulidis et al., 2017). The stakeholder theory is, therefore, the antithesis of Milton Friedman's shareholders' philosophy. Friedman's arguments claim that the only stakeholder that is worthy of corporations' attention is the 'shareholder' (Wellington and Zandvakili, 2007). In this sense, organisations' primary objective should always be the maximisation of shareholders' funds. In contrast, Freeman argues that it is a fundamental obligation of corporations to attend to the needs and expectations of all of their stakeholders, including shareholders (de Gooyert et al., 2017). Freeman encourages companies to find a balance between their need to maximise profit and their social and environmental obligations. Freeman argues that the long-term survival of a firm is not only influenced by its ability to maximise shareholders' funds, but also by its ability to maintain a good relationship with a diverse range of stakeholders including customers, employees and the general public (Lozano, 2005).

The stakeholder theory has made a significant contribution to the conceptualisation of the link between social responsibility and the long-term economic sustainability of firms (Fuzi et al., 2017). Freeman's arguments have already been incorporated into the social sustainability research and several attempts have been made to empirically confirm the link between social sustainability initiatives and firms' economic performance (e.g. Cheng and Ahmad, 2010).

2.3.3 Corporate Sustainability (CS)

The publication of the Brundtland Commission's report in 1987 signalled a new era for sustainable development in general and for sustainability research in particular. The report defined sustainability broadly as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 3). This definition broadened the concept of sustainability so widely that it could incorporate any activity (social, economic, environmental and others) that contributes, directly or indirectly, to the ability of current and future generations to meet their needs. It absorbed the principles advocated by the stakeholder and CSR theories and left the door wide open for the incorporation of new pro-sustainability values and principles. This facilitated the advent of the Triple Bottom Line (TBL) concept.

TBL was first introduced by John Elkington in 1994. Elkington (1997) conceptualised sustainability as a tri-dimensional construct made of three interdependent pillars, namely: social, ecological and economic (Buyukozkan and Cidci, 2012). According to Elkington, an organisation will only become truly sustainable when it reaches a balance between the three pillars of sustainable development.

Elkington's view of sustainability gained a strong support from sustainability scholars. In fact, the TBL concept is one of the most commonly quoted theories of sustainability (e.g. Padin et al., 2016). It facilitated a shift away from the silo view of sustainability towards a more holistic understanding of sustainable development. In fact, there is consensus among scholars that there is a need to recognise the multi-dimensional nature of sustainability (e.g. Wahid and Mustamil, 2017). That is why many studies in literature operationalise sustainability using Elkington's theory (e.g. Govindan et al., 2013; Pires et al., 2016). Accordingly, recent studies tend to explore the nature of the relationship between three pillars of sustainability and business performance (e.g. Agrawal et al., 2016). To date, the relationship between TBL and firms' financial performance remains inconclusive (Assaf et al., 2012); even though several empirical investigations have confirmed the existence of a direct, positive relationship between sustainability and improved business performance (e.g. Eilers et al., 2016).

The evolution of Corporate Sustainability, embodied in the concept of TBL, has contributed to the advent of a new area of research, namely: sustainable business models (SBMs). SBMs seek to incorporate TBL into every aspect of companies' organisational, operational and strategic management in search for sustainable competitive advantages (Prendeville and Bocken, 2017). The goal of SBMs is economic sustainability, but the means of achieving that goal is TBL.

There are numerous studies in the literature that explore the relationship between corporate sustainability and competitive advantage (e.g. Maletic et al., 2015). Many of these studies confirm that CS is means of boosting firms' competitiveness (e.g. Kwarteng et al., 2016). However, the concepts of CS and CSR have been used interchangeably in many occasions (e.g. Camilleri, 2016; Wilburn and Wilburn, 2013). It appears that scholars view CSR as part of CS and vice versa. Despite their differences, a systematic review of sustainability literature by Montiel (2008) concluded that the conceptualisations of CSR and CS had slowly but noticeably converged in recent years.

2.3.4 Circular Economy (CE)

Circular Economy is one of the most recent and by far the broadest, evolutionary concepts of sustainability (Korhonen et al., 2018). It is much broader than CS, CSR and TBL combined because it incorporates everything and everyone that has a direct or an indirect impact on the ecosystem. The development of green or circular economies is seen as the right way forward towards a system that balances the needs of economic growth and social development with the planet's ecosystems' regenerative capacity (Ritzén and Sandström, 2017). Scholars have recently begun to discuss the idea that if economic growth cannot happen without the consumption of natural resources, the least corporations can do is engaging actively in

resource-saving initiatives (Franklin-Johnson et al., 2016). Governments, however, have to play a significant role in the promotion of CE by creating a level-playing field whereby all businesses are either encouraged or forced to participate in country-wide CE initiatives through economic policies, environmental regulations, etc (Geissdoerfer et al., 2017).

CE is different from sustainable development. CE is part of SD, but it cannot substitute it (Geissdoerfer et al., 2017). Like CSR and TBL, CE is a means of achieving sustainable development, but at a much larger scale. CE encourages decision makers to focus on resource efficiency through a variety of pricing schemes, market regulations and economic policies (Maio et al., 2017). The 5p charge for single-use carrier bags that was recently introduced in the UK is an example of a pricing scheme that can be used to discourage environmentally-damaging behaviours on a national scale. This scheme proves that pro-sustainability government policies do not only facilitate a societal shift towards greener and more circular economies, but they can also enact pro-environmental behaviours.

The proponents of CE argue that pro-sustainability government policies are crucial in the fight to get businesses more actively engaged in sustainable development because they encourage investors to diversify and redirect their investments away from environmentally-damaging industries towards greener business sectors (Lazarevic and Valve 2017). Government policies also help in the development of 'new normal' whereby reuse, recycling and remanufacturing becomes a norm, and the use of fresh natural resources becomes de-normalised (Tecchio et al., 2017). More importantly, as governments create a level-playing field in terms of CE obligations and responsibilities, green policies encourage businesses to innovate in search for differentiation or competitive advantages (Jensen and Remmen, 2017).

2.3.5 Green Economy (GE)

The origins of GE can be traced back to 1992 and more specifically to the United Nations' (UN) Rio de Janeiro conference from which the concept of sustainable development emerged. In the same place, 20 years later, in the same conference (Rio + 20), "green economy" was coined as a practical substitute to the initial conceptualisation of sustainable development (Buseth, 2017). GE is aimed at international and transnational organisations such as the UNEP and the World Bank which are seen as facilitators of the transition towards sustainability. Conceptually, GE has exactly the same principles and objectives as sustainable development. The only difference is that it provides a much clearer pathway for countries to move closer towards meeting their sustainability obligations, and for businesses to contribute more actively to tackling the problems of poverty and climate change (Weber and Cabras, 2017).

GE emphasises the important role of governments and policy-makers in tackling national and global problems such as slow economic growth and climate change (Buseth, 2017). It encourages policy-makers to work closely with business leaders; to come up with market-based solutions that simultaneously address the problems of economic growth and climate change (Droste et al., 2016); and to create a greener, global economic system (Gasparatos et al., 2017). In other words, the concept of GE is based on the assumption that global sustainable development can be achieved by improving or changing the current national and international economic systems (Ehresman and Okereke, 2015).

2.4 Sustainability Implementation

Although sustainability research has become increasingly prominent in recent years, there remains a wide gap between what is known and what is put into practice. Sustainability scholars have not yet sufficiently addressed this issue. However, there have been several scholarly attempts to advance theory building in the area of sustainability implementation. This section reviews some of the prominent theories and models that conceptualise the embedment of sustainable development principles into organisations' management systems.

2.4.1 Embedding Sustainability into Strategic Management

There are several models and frameworks that conceptualise the process of embedding sustainability into companies' strategic management functions. For example, Epstein and Roy (2001) proposed a conceptual framework to help managers formulate sustainability strategies; develop sustainability initiatives and programs; design sustainable management systems and structures; and measure sustainability performance. The framework was designed to bridge the gap between theory and practice and between strategy and action. It highlights the actions, structures and systems that are needed to foster a culture of sustainability and to align companies' sustainability efforts with their business goals. However, the framework focuses more on understanding the impact of sustainability on social and business performance, but less on the process of sustainability implementation and institutionalisation.

Similarly, Engert et al. (2016) put forth a conceptual framework that outlines the internal and external factors which support or hinder the integration of sustainability with strategic management. The framework was theoretically based on the outcomes of a literature review of 114 peer-reviewed scientific papers. It also borrowed classic theories of strategic management and applied them to sustainability in order to advance our understanding of the implementation processes of corporate sustainability strategies.

Furthermore, Galbreath (2009) proposed a framework that links and integrates companies' CSR efforts with their business strategies. The framework is based on the argument that the traditional approaches to CSR are far removed from strategic management and that should not be the case. It supports the embedment of sustainability into core business strategies. Similarly, Nathan (2010) put forth a conceptual framework that outlines the factors that are needed to incorporate sustainability into the strategic management process. It highlights how different organisational variables affect the implementation of corporate sustainability strategies.

2.4.2 Embedding Sustainability into Performance Management

There are several conceptual frameworks in the literature that focus primarily on the integration of sustainability performance indicators with companies' management control systems. For example, Morioka and de Carvalho (2016) developed a conceptual framework based on the outcomes of a literature review of 261 papers. The framework conceptualises the principles of sustainable development; the practices and processes of sustainability; and the internal and external factors that affect the implementation processes of sustainability. Similarly, Günther et al. (2016) developed a conceptual framework that establishes a link between sustainability and companies' strategic competitiveness. It illustrates how the embedment of sustainability in organisations' management control systems leads to positive strategic outcomes. It also highlights the different interfaces that exist between subsystems of environmental management and those of strategic management.

Moreover, De Villiers (2016) developed a conceptual model that outlines the factors that drive or influence companies' sustainability implementation efforts. The model illustrates how the integration of sustainability with performance control systems (e.g. balanced scorecards) can bring about a variety of benefits to organisations. It puts an emphasis on the importance of external stakeholders' involvement in the adoption and implementation of new sustainability initiatives. The importance of stakeholders' engagement is also emphasised by the work of Simas et al. (2013) which argues that sustainability cannot be successfully operationalised without a sufficient involvement of internal and external stakeholders. Simas et al. (2013) developed a theoretical model which is based on the proposition that successful integration of sustainability into corporate strategies is primarily influenced by two key variables, namely: leadership and stakeholders. The model deals with the relationship between stakeholders' involvement and the successful operationalisation of sustainable organisational strategies.

Another decision-making model by Garcia et al. (2016) also embraced a stakeholder view of sustainability operationalisation. The model combines the concept of triple-bottom-line with

the stakeholder theory in order to facilitate more effective decision-making especially in relation to the alignment of companies' sustainability efforts with stakeholders' expectations.

2.4.3 Embedding Sustainability into Operations Management

There are few models and frameworks that focus on the embedment of sustainability into the operations management function. For example, Demertzi et al. (2016) put forth a life cycle assessment (LCA) methodology to help organisations assess the impact of their production operations. Although the methodology does not necessarily improve our understanding of how sustainability is implemented and operationalised at the shop-floor level, it does outline the different stages of a cradle-to-bottling approach to production. It also helps organisations to highlight the areas or stages of production that have the highest impact on the environment so that management may focus their pro-sustainability efforts specifically on these areas rather than the entire production process. Similarly, Unger and Landis, (2016) developed a model to help organisations assess the economic and environmental impacts of their supply chain operations. The model is conceptually based on two theories, namely: the Life Cycle Cost Assessment (LCCA) and the Life Cycle Assessment (LCA). The model's validation confirmed that it could be used successfully to optimise organisations' value chain activities.

Moreover, Hart (1997) proposed a very basic and generic framework for the embedment of corporate sustainability into companies' operations. The model comprises three main stages, namely: pollution prevention; product stewardship; and cleaner technology. It is based on the assumption that sustainability implementation is an organic process that begins with the management, control, minimisation and ultimately the prevention or elimination of pollution. Once the environmental impact is monitored, managed and controlled, the next step for companies is to embrace product stewardship and focus their attention on eco-innovation. The last step is to adopt cleaner technologies that facilitate the companies' pivot towards cleaner production and green operations management.

Azapagic (2003) proposed a much more comprehensive framework for the embedment of sustainability into companies' operations. The framework is based on the guidelines of ISO management systems and the Plan-Do-Check-Act (PDCA) cycle framework. It comprises five stages, namely: policy development; planning; implementation; communication; review and corrective action. Although the framework appears generic, it provides a flexible structure that enables organisations to tailor the implementation process to their specific needs. A similar, but a more detailed framework was proposed by Maon et al. (2009). Maon's et al framework is also based on the PDCA cycle framework, but it provides far more detailed guidelines on how to embed sustainability in companies' operations. It consists of four stages, four steps, and nine

activities. The four stages are: sensitise; unfreeze; move; refreeze. The four steps are plan; do; check/improve; and mainstream. The nine activities are: raise awareness; assess corporate purpose; establish a sustainability vision; assess current state; develop a pro-sustainability strategic plan; implement the strategic plan; communicate the management commitment to sustainability; evaluation the integration strategies; and institutionalise the changes.

2.4.4 Embedding Sustainability into Supply Chain Management

There are numerous models that conceptualise the embedment of sustainability into companies' supply chain management functions. For example, Seuring and Müller, (2008) put forth a conceptual framework for sustainable supply chain management. The framework does not clarify how sustainability should be implemented, instead, it provides a holistic conceptualisation of how sustainability is embedded into supply chain operations to improve performance, reduce risks and respond to external pressures.

Roscoe et al. (2016) also put forth a framework that conceptualises how close collaboration between supply chain partners can facilitate the development and diffusion of pro-sustainability innovations. The framework suggests that the development of eco-innovations within a supply network follows one of three possible routes of collaboration, namely: loose collaboration; tight collaboration; and bridged collaboration. The loose form of collaboration aims to identify and absorb eco-innovations that already exist in the supply network. In contrast, the tight form of collaboration seeks to work closely with supply network partners to develop and diffusion entirely new innovations. The last form of collaboration is a combination of the first and second forms of collaboration.

Similarly, Li and Li (2016) put forth a game model that aims to achieve closer integration between the vertical supply chain operations with the intention to optimise operational efficiency and product sustainability. However, the validation process of the model concluded that the level of vertical integration proposed by the model was only valid when market competition was very low. This means that the model's propositions are only viable in industries or sectors with relatively low rivalry.

Moreover, Giri and Sharma (2016) proposed a closed-loop supply chain management model to help organisations manage their reverse logistics operations with a focus on returned items. The model conceptualises the functions of an inventory management system under stochastic market demand with the intention to optimise the quantities of finished goods and to improve the efficiency of supply chain operations through closer integration of forward and reverse logistics operations. The model provides guidelines on how to better coordinate the

manufacturing and remanufacturing operations in an environment characterised by uncertainty, turbulent demand and high risk of supply disruption.

Demirel et al. (2016) also proposed a model to help companies embed sustainability into their reverse logistics networks. They used linear programming to generate an optimal network design that incorporates recycling operations into manufacturers' value chain network. Their model was validated using case studies of Turkish manufacturers. Similarly, Wu and Barnes (2016) used multi-objective programming (MOP) and analytic network process (ANP) to develop a model that facilitates the implementation of green supply chain initiatives. The model focuses primarily on the closer integration of focal companies' supply chains operations with those of their supply network partners. Their model was validated using a case study of electrical appliances' manufacturer.

2.4.5 Multidisciplinary Approaches to Sustainability Implementation

Although not many, some scholars seem to have embraced a multidisciplinary approach to the conceptualisation of sustainability implementation. For example, Jabbour and de Sousa Jabbour (2016) put forth a "synergistic and integrative framework" to help organisations integrate their HRM functions with their SCM operations. They argue that successful implementation of Green Supply Chain Management (GSCM) initiatives is difficult, if not impossible, without the support of the Human Resources Management (HRM) functions. Their argument is based on the fact that GSCM initiatives are implemented and operationalised by people and without the people's buy-in the implementation efforts will almost certainly fail. HRM interventions help to secure the much needed employee and management buy-in prior to the commencement of implementation. The novelty of Jabbour and de Sousa Jabbour's (2016) framework stems from the multidisciplinary nature of their research, and the assumption that successful implementation of sustainability initiatives is contingent on managers' willingness to recognise the interdependencies that exist between different business functions as well as their abilities to manage the implementation process holistically.

Formentini and Taticchi (2016) also proposed a framework that is theoretical in nature and it seeks to achieve closer integration between the corporate sustainability's governance functions and supply chain control mechanisms. The framework is conceptually based on three theories, namely: resource-based view theory; contingency theory; and strategic alignment theory. Using seven case studies from a variety of industries, Formentini and Taticchi concluded that closer integration and collaboration between the corporate governance function and supply chain control mechanisms would facilitate the implementation and formalisation of new, pro-sustainability initiatives. Similarly, Carter and Rogers (2008) proposed a sustainable supply

chain management framework to help organisations integrate social, economic and environmental goals with their business strategies. Their framework is based on various theories from political science to strategic management and biology. It provides a solution to the fragmented approach of sustainability implementation where different environmental and social sustainability initiatives are implemented in isolation.

2.5 Pro-Sustainability Behaviour in Workplace

Exploring the negative impact of human activity on the environment has become very popular among scholars of different disciplines in the last three decades (e.g. Shaaban and Scheffran, 2017; Hassan and Lee, 2015). Initially, the focus was on industries which were believed to be the greatest contributors to pollution and the highest producers of greenhouse gas emissions such as the coal industry. Governments introduced new policies to restrict industrial pollution and developed environmental regulations to restrict or at least control the pollution of water, air and land (Leman et al., 2010). Gradually more industries were targeted and even moderate polluters were expected to adhere to very strict environmental regulations (Ramanathan et al., 2010). Today, even the service industry is expected to show a high level of commitment to environmental management (Evangelista et al., 2017).

As governments continue to regulate the environmentally-damaging industries, scholars' attention has shifted towards the management of operations within these industries (e.g. Ji et al., 2017) and the management of people who work in them (e.g. Kopnina, 2017). Recently, sustainability scholars have come to realise that human behaviour may contribute favourably or unfavourably to governments' and corporations' environmental management efforts (Thatcher and Yeow, 2016). That's why there are hundreds of empirical studies exploring the factors that might help nurture a more sustainable lifestyle (e.g. George-Ufot et al., 2017).

Companies are run by people; their operations are managed by people; any new systems or initiatives are implemented by people; and the success of any new system or initiative is contingent upon the people's willingness to embrace it. Therefore, if people's attitudes are influenced in favour of sustainability, the diffusion of pro-sustainability initiatives in organisations and in societies as a whole will become much easier. It is this assumption that led to the development of a new area of research in the field of sustainability, namely: pro-environmental behaviour management (Moghimehfar and Halpenny, 2016).

Tang et al. (2017; p. 140) defined pro-environmental behaviour as an inclination towards "minimising the negative impact and intensifying the positive impact of one's activities on the natural environment". Scholars in the fields of sociology and psychology have, for many years,

explored the factors that influence a person's pro-environmental behaviour in households (e.g. Abrahamse et al., 2005; Larson et al., 2015). However, only recently, researchers have begun to investigate pro-environmental behaviour in a workplace context (e.g. Paillé and Boiral, 2013; Dumitru et al., 2016). They borrowed existing theories and models such as altruism (Fontana, 2017) and applied them to the workplace in an attempt to identify the factors or variables that influence the pro-environmental behaviours of employees.

Pro-environmental behaviour is inherently a multidisciplinary construct. Hence, it has been studied by scholars from a variety of disciplines including but not limited to ecological economics (e.g. Chankrajang and Muttarak, 2017); psychology (e.g. Swami et al., 2011); management (e.g. Dentoni et al., 2012); sociology (e.g. Csutora, 2012); and education (e.g. Cheang et al., 2017). Economists tend to explore how social-economic variables such as the price of a product or service and annual income influence a person's pro-environmental behaviour (Diederich and Goeschl, 2017). Psychologists, on the other hand, have their attention primarily on the internal variables such as people's attitudes, past experiences, beliefs, values, etc (Kiatkawsin and Han, 2017). In contrast, management and education scholars tend to explore how organisational interventions such as training, involvement, and empowerment would facilitate the diffusion and adoption of pro-sustainability behaviours and initiatives (Robertson and Barling, 2017; Levy and Marans, 2012).

There are numerous internal factors that influence people's decisions to adopt or reject pro-environmental behaviours and/or initiatives. These factors can be divided broadly into three categories, namely: social variables; cognitive variables; and affective variables. The social variables include personal norms and subjective norms; whereas the cognitive variables include behavioural intention, knowledge/awareness and perceived behaviour control. The affective variables, on the other hand, are concerned with individuals' attitudes and values. See Appendix 1 for more information about each of these categories.

2.6 Sustainability in Universities

As educators, universities play a significantly important role in the diffusion of sustainability at the local, national and international levels. Recently, universities have become much more vocal and expressive about their commitment to sustainability and their involvement in pro-sustainability initiatives (Yoshida et al., 2017). In the past three decades, in particular, the number of universities that engaged in the institutionalisation of sustainability through a variety of schemes such as GRI (Global Reporting Initiatives) has increased significantly (Dagilienė and Mykolaitienė, 2015). This is perhaps because of increased popularity of sustainability among corporations (Stacchezzini et al., 2016) and increased level of awareness

among societies in relation to the problem of climate change, and how pro-sustainability initiatives contribute to the global effort to tackle this problem (Geiger et al., 2017).

Universities contribute to the problem of climate change as well as to the solution of this problem. As businesses, universities do engage in activities that are not necessarily eco-friendly (Huang et al., 2017), such as the rapid consumption of paper, even though many universities tend to use recycled paper. On the other hand, universities make a significant contribution to sustainability by educating the new generations and the old ones about their environmental, social and economic responsibilities (Guerra et al., 2016).

2.6.1 Evolution of Sustainability in Universities

Research into sustainability implementation in higher education institutions has evolved over the years to cover a broad range of areas, including but not limited to: embedment of sustainability in professional development programmes (Holdsworth et al., 2008); students' perception of sustainability (Yuan and Zuo, 2013); universities' commitment to the adoption of sustainability (Lee et al., 2013); and the factors that support or hinder the implementation of pro-sustainability initiatives in higher education institutions (Velázquez et al., 2005). A literature survey by Wals and Blewitt (2010) explored the recent trends in sustainability research in the context of higher education institutions between 2001 and 2010 and concluded with three research themes, namely: ecological footprint reduction; greener university operations management; and environmental management. The first theme is concerned with reducing universities' consumption of resources such as paper, water and power, while the other theme is concerned with the technologies that facilitate the transition towards sustainable management. The third theme is concerned with the umbrella management system that dictates the scope and magnitude of all pro-environmental initiatives.

Environmental management, as a concept, is not new to universities (Dagiliūtė and Liobikienė, 2015). Like many other businesses, universities have taken an active role in the management of their environmental affairs and in the minimisation of their ecological footprint (Gómez et al., 2016). What is new is that the responsibility of environmental management has gradually permeated to all parts of the organisation. Traditionally, environmental management is seen as the responsibility of estates department (Ozawa-Meida et al., 2013). This has changed entirely. Today, every department is expected to participate in pro-environmental initiatives and every member of the specified departments is expected to actively participate in the diffusion and operationalisation of these initiatives (Leon-Fernandez et al., 2017). In other words, the responsibility of environmental management is no longer concentrated in one department.

Instead, every employee is partly responsible for environmental management and is expected to take all the necessary steps to reduce their ecological footprint.

However, there are universities in which the responsibility of environmental management is still concentrated in single departments or in isolated teams. In such universities, sustainability is still seen as an innovation (Waas et al., 2010) and the principles of sustainable development will likely take many years to permeate down to all departments. There are several factors that can help accelerate the rate of sustainability diffusion in higher education institutions. At the corporate level, for example, universities need to have clear sustainable development policies and must declare their commitment to sustainability as part of their corporate strategies. Without a declaration of commitment, there will be no sense of urgency among the employees to participate in the implementation of new sustainability initiatives (Lee et al., 2013). Sustainability policies are equally important as they provide the organisational framework and procedural architecture needed to facilitate the embedment of sustainable development principles into the day-to-day activities of the organisation.

Sustainability implementation in universities may be hindered by a variety of barriers. The most common barriers include organisational resistance; insufficient financial resources; unsupportive administrators; lack of awareness; lack of management commitment; inadequate involvement; ineffective information-sharing; lack of training and incentives for employees; and lack of interest from line managers (Ferrer-Balas et al., 2008).

Despite the challenges, universities have made a significant progress in relation to sustainable development. They have become much more active in regional development (Dlouha et al., 2013) and their leadership has expressed greater commitment to sustainability (Lee et al., 2013). More importantly, many universities have begun to incorporate the principles of sustainable development into the design of their courses and educational activities in an attempt to make greater contributions to sustainable societal development (Karatzoglou, 2013).

2.6.2 Implementation of Sustainability in Universities

The literature that explores universities' or higher education institutions' experiences with the implementation of sustainability initiatives can be divided into four main themes or categories; namely, supporting and hindering forces; stakeholders' role; organisational change processes; and assessment and reporting activities. This section discusses each of these themes.

2.6.2.1 Supporting and Hindering Forces

In the first theme, studies focus on the factors that support or hinder the implementation and/or the institutionalisation of sustainability in universities (e.g. Larran et al., 2015). For example, Lozano et al (2015) carried out a detailed review of the sustainability implementation literature and conducted a global survey that looked into universities' commitment to sustainability. Their study found that although higher education institutions were strongly committed to sustainable development, their approach to the implementation of pro-sustainability initiatives was often fragmented and lacked any sense of integration. They argued that a holistic and much more integrated approach to implementation was needed in order to facilitate a smoother transition towards sustainable development. They also found a very strong link between long-term commitment and successful implementation of sustainable development initiatives.

Ávila et al. (2017) explored the main challenges that hinder the adoption of sustainability practices globally. Their study involved 172 universities from different parts of the world and a total of 301 experts participated in their investigation. The collected data was analysed, both quantitatively and qualitatively. Their findings suggest that the main barriers to sustainability implementation in universities, beyond geographical boundaries, include lack of support from senior managers and administrators; decision-makers' unwillingness to commit to sustainable development; and lack of financial support for pro-sustainability initiatives. They concluded that without adequately addressing these issues and securing the buy-in of senior management in particular, the transition towards sustainability would almost certainly fail.

Schmitt-Figueiro and Raufflet (2015) also performed a systematic review of sustainability implementation in higher education institutions, using journals published between 2003 and 2013. Their review concluded that the implementation of pro-sustainability initiatives in higher education institutions was often obstructed by three common barriers, namely: (1) lack of change management skills and the incompetence of the managers whom are responsible for the diffusion, implementation and operationalisation of the new initiatives; (2) managers' inadequate understanding of what sustainability entails; and (3) lack of support and commitment from senior management, including deans and programme leaders. The authors complained about the lack of consistency in the conceptualisation of sustainable development as they found that sustainability was conceptualised differently in different studies despite being investigated under similar contextual circumstances

Blanco-Portela et al. (2017) also performed a systematic review of the main barriers and drivers of sustainability implementation in higher education institutions using journals published between 2000 and 2016. Their intention was to identify the best practices for the

integration of sustainable development practices into higher education institutions' systems of management and also to discuss the different strategies, actions, tactics, etc that can help the institutions overcome the most common implementation barriers. In terms of drivers, their review concluded that higher education institutions were often driven to embrace sustainability by stakeholders' pressure (internal and external); the desire for institutional legitimacy and credibility; global treaties; and the moral obligation to show greater commitment to tackling the global problem of climate change. In terms of barriers, the findings indicated that the institutions' pro-sustainability efforts were often obstructed by lack of financial resources; departmentalism; unsupportive management; lack of incentives, poor institutionalisation of the principles of sustainable development; and ineffective behavioural interventions.

Disterheft et al. (2015) conducted an empirical investigation into the use of participatory approaches as facilitators for the implementation of sustainability in universities. Their exploratory study involved participants from twenty countries with the intention to identify the factors whose impact on the success of sustainability implementation crosses the cultural and geographical boundaries. Their study concluded with an emphasis on the need for universities to evolve and move away from their current silo approach to environmental management towards a much broader approach that focuses on participation, involvement and empowerment. They argued that the use of participatory approaches was crucial to facilitate the implementation of pro-sustainability practices. They claimed that these approaches would help universities to nurture a culture of participation which is, arguably, critical for successful implementation of new pro-sustainability initiatives.

Aleixo et al. (2016) explored the role of stakeholders as facilitators and also as potential obstructers of sustainable development in Portuguese higher education institutions. They carried out semi-structured interviews with twenty influential stakeholders whose opinions, perceptions and attitudes were believed to shape the institutions' sustainability policies. The content analysis of the interviews revealed that the most common barrier was lack of awareness. Some stakeholders were not aware of the principles of sustainable development or what it meant for an institution to be sustainable. The second most significant barrier was the lack of financial resources. The stakeholders complained about the recent fall in the number of university students and the decline of direct funding from the Portuguese government. The authors argued that university leaders should be more imaginative in terms of identifying new sources of finance and should also create more flexible forms of organisation which can swiftly adapt to changes in their business environments.

Larran et al. (2015) also investigated the factors that support the implementation of sustainability practices and the obstacles universities have to overcome in order to successfully operationalise the newly-implemented initiatives. Their study explored the experiences of Spanish universities by surveying senior managers. They found Spanish universities to have made a very slow progress towards sustainable development. The authors blamed the universities' lackluster progress on a number of barriers which included inadequate financial commitment; lack of specialisation; insufficient administrative support; and organisational resistance. They emphasised on the need for the universities' leaders and senior managers to loudly communicate their commitments to sustainability to all members of their organisations.

2.6.2.2 Stakeholders' Role

In the second theme, studies tend to focus on the role of stakeholders in the implementation of pro-sustainability initiatives in higher education institutions (e.g. Wright, 2010). For example, Dentoni and Bitzer (2015) explored the role of stakeholders in the embedment of sustainable development principles into the management activities of universities. Their study investigated how universities collaborate with multiple stakeholders in order to find appropriate solutions to the "wicked" problem of climate change. They found that academics, as stakeholders, played a significantly important role in the diffusion of pro-sustainability initiatives, not only as educators but also as knowledge bearers; agenda-setters; consultants; and facilitators for the implementation of multi-stakeholder, pro-sustainability initiatives.

Similarly, Sammalisto et al. (2015) explored the role of universities' faculty staff in the implementation of pro-sustainability initiatives. Their investigation was based on a case study of a Swedish university that went through the experience of ISO 14001 implementation and operationalisation. They found that staff's perception of sustainability had an impact on their involvement and participation in the implementation efforts. They also found that senior management's commitment and continuous staff training were significantly important for successful institutionalisation of sustainability.

Kuzu et al. (2013) also explored the role played by internal and external stakeholders in the transition towards sustainability using Selçuk University as a case study. They developed a model that conceptualises the role of stakeholders in the sustainability change process. The conceptual model was validated using a questionnaire which targeted university's internal and external stakeholders (i.e. staff and students; and civil societies, governments, businesses, alumni, etc). The University was found to have focused more on community service and less on education for sustainability. The authors concluded that the involvement and participation

of, both, internal and external stakeholders was an essential ingredient for a successful transition towards sustainable development in higher education institutions.

Another study by Cebrian et al. (2015) investigated universities' academic staff's engagement and participation in an 'education for sustainable development' initiative. Their investigation was exploratory in nature and focused primarily on the experience of the University of Southampton. They interviewed academic staff from a variety of disciplines and found that although the academics expressed high levels of commitment and willingness to participate in the actualisation of the initiative, there were numerous barriers that obstructed their involvement. The barriers included unsupportive organisational conditions; academic pressures; bureaucracy; inadequate understanding of sustainable development; insufficient resources; and time constraints. The authors concluded that leadership commitment, organisational support and effective human resources management policies were essential ingredients to secure staff buy-in and engagement in the sustainability agenda.

Wright (2010) examined how the attitudes of Canadian universities' leaders influence the institutions' commitment to sustainability. The research focused primarily on the universities' presidents and vice-presidents as key stakeholders with a significant influence on policy-making and decision-making processes. It was found that although the universities' leadership were well aware of the concept of sustainable development, they did not know what it meant for their universities to be sustainable. In other words, they knew the theories, but they were unfamiliar with how the theories can be put into practice. Besides, the study found that although the leaders of Canadian universities had favourable attitudes towards sustainability, the institutions' transitions were hindered by numerous barriers, including organisational resistance; lack of awareness among staff; and financial constraints.

Moreover, Krasny and Delia, (2015) looked into how students can be better engaged and involved in the implementation and actualisation of universities' sustainability initiatives. Their study explored the need for formal organisational policies and procedures to engage students, as stakeholders, in the sustainable development agenda. It was based on both, interviews with students and a systematic review of the literature. They concluded that the involvement and engagement of students in voluntary stewardship initiatives did not only benefit the students themselves but also helped the universities to develop a more holistic approach to sustainable development - an approach that incorporates both internal and external stakeholders.

2.6.2.3 Organisational Change Processes

In the third theme, studies tend to focus on the organisational change processes which define the way new sustainable development initiatives are implemented and the organisational conditions that facilitate or obstruct organisations' transition to sustainability (e.g. Mader et al., 2013). For example, Hoover and Harder (2015) conceptualised organisational change for sustainability in the context of higher education institutions in an attempt to develop a more comprehensive understanding of the many interdependent processes that define the shape and outcome of organisations' transitions towards sustainability. They conducted a meta-ethnography of thirteen sustainability transition studies and used the 'grounded theory approach' to generate nine themes of institutional change. Their study concluded with recommendations on how to improve universities' approach to change management in order to facilitate a smoother transition towards sustainability. They recommended that universities should engage actively in a genuine dialogue; recognise the contradictions and tensions that exist between the different parts of their organisations; utilise "double loop" learning; and develop much more flexible organisational structures and procedures.

A similar study by Verhulst and Lambrechts (2015) utilised change management theories as a lens to help identify, understand and explain the factors that support or hinder the implementation of sustainability in higher education institutions. Their investigation, however, focused primarily on the human factors such as culture, involvement, empowerment, organisational resistance and communication. They used the Leuven University College as a case study and developed a model that conceptualises the factors that have an impact on the sustainability transition process. The model also conceptualised the interdependencies that exist between the different factors. They concluded that sustainability transition must not be perceived as a linear process. Instead, it needs to be understood as a continually-evolving process with a feedback loop. They also argued that the sustainability implementation process might be characterised by fatigue, de-motivation and a high risk of rebound effect.

Mader et al. (2013) explored the factors that influence the initiation, implementation and operationalisation of sustainability in higher education institutions. Their investigation stressed the importance of change management as an ingredient for successful institutionalisation of pro-sustainability practices in higher education. They also put an emphasis on the role of leadership and governance as facilitators of change. The authors concluded that an institutional approach to sustainability transition was needed to successfully embed the principles of sustainable development into universities' systems of management; curriculum; policies and procedures; and day-to-day activities.

Lozano et al. (2015a) conducted an investigation into how to incorporate the theories and concepts of 'change management for sustainability' into higher education curricula using the University of Leeds as a case study. They looked into how to develop a BA course that's specifically tailored to deal with the complexities of sustainability implementation. They were successful in the design and development of a course that adheres to the university's guidelines and meets the needs of future generations of sustainability change agents.

Lee and Schaltegger (2014) investigated how the active involvement of leaders in sustainability transitions enabled and facilitated the transformation of sustainability education in higher education institutions. Their investigation also explored the interactions between institutional contexts and university staff's participation in the change process. They found that leaders of universities had a significant influence on staff's mindsets and attitudes towards sustainability as well as on the change process through which the principles of sustainable development were incorporated into the curricula.

Holm et al. (2015) also investigated the role of university curricula as a facilitator of change. They used 11 Nordic universities as case studies and looked into how the embedment of "education for sustainable development" into universities' curriculum and management systems might help speed up their transition towards sustainability. From the case studies, they were able to identify the factors that supported or hindered the universities' sustainable development agenda. These factors were then used to develop a "process framework" that could be used by universities to successfully embed "education for sustainable development" into their curricula and management systems. The framework comprises four phases; namely, planning, assessment, monitoring and implementation. The framework was validated and it was successfully used to visualise the education for sustainable development's implementation at the case study institutions.

2.6.2.4 Assessment and Reporting Activities

In the fourth theme, studies focus on sustainability assessment and reporting (e.g. Berzosa et al., 2017). For example, Malandrakis et al. (2017) investigated the experience of the University of Western Macedonia with the implementation and operationalisation of sustainability assessment and reporting. They used the University's experience as a case study to develop an assessment system and a process that takes into the account the three pillars of sustainability; namely, environmental, social and economic. They concluded that universities' sustainability assessments needed to include more quantitative measures and performance targets in order to monitor, control, manage and more importantly demonstrate the progress that had been made in relation to their transition towards sustainable development.

Alonso-Almeida et al. (2015) explored the diffusion of sustainability reporting in universities using both, quantitative and qualitative research methods. They acquired raw data from the Global Reporting Initiative Disclosure Database and analysed it quantitatively and qualitatively in search for themes, patterns and/or trends. They found that the diffusion of sustainability reporting in universities was still in its infancy. The rate of diffusion turned out to be much slower than they had anticipated. Their findings also suggested that there would not be any significant changes in the current trends in relation to the uptake of sustainability reporting by universities. In fact, they anticipate the rate of diffusion to remain sluggish for some years to come. Hence, they recommended that internal and external stakeholders such as staff and students should increase pressure on university leaders to commit to sustainable development and to engage more actively in sustainability reporting initiatives.

Similarly, a study by Adams (2013) investigated sustainability reporting by universities and found that the higher education industry lagged far behind other industries and sectors. The study also explored the link between performance management and sustainability reporting. Adams found that sustainability reporting often resulted in increased accountability which in turn led to improvements in performance.

Ceulemans et al. (2015) carried a systematic review of the sustainability reporting in higher education and identified a number of inconsistencies and gaps that exist in the sustainability literature. Their aim was to highlight the current trends and draw new paths for future research. Their investigation found that the subject of sustainability reporting in higher education institutions was explored in a fragmented and superficial way and that the current studies lacked depth in terms of both, conceptualisation and analysis. They concluded that there was an urgent need for more in-depth research on the links between sustainability reporting on the one hand and performance indicators, stakeholders' engagement and organisational change processes on the other hand.

Berzosa et al. (2017) also conducted a review of the sustainability reporting literature, but they focused their research on the tools used by higher education institutions to assess their sustainability performance. The review was followed by an empirical investigation into the advantages and disadvantages of the different sustainability assessment tools, with the intention of creating an action plan that would help higher education institutions to measure, monitor and manage their sustainability performance cost-efficiently. Their action plan was practically validated and was found to result in 20-40% improvement in the overall sustainability performance, in the medium term.

2.7 Current Gaps in Sustainability Research

2.7.1 Gap #1: There Is a Need for Broader Conceptualisation

Theories and concepts of sustainable development have evolved rapidly in the past few decades and will continue to evolve in the many years to come (Rajeev et al., 2017). The scope of research has also widened over the years from corporate social responsibility (Eteokleous et al., 2016), to corporate sustainability (Vildåsen et al., 2017) and to the current trend of green economics (Loiseau et al., 2016). However, sustainability scholars need to abandon the silo approach to studying sustainable development. Organisations' transition towards sustainability must not be examined in isolation from the economic and socio-political environments. Instead, sustainability researchers should move towards a more holistic understanding of sustainability diffusion. They must recognise the importance of policy instruments and the vital role played by governments not only as facilitators but also as driving force.

The literature survey revealed that there is a trend towards a broader conceptualisation of sustainability and the firm. Initially, firms had to respond to an increased pressure from their internal and external stakeholders (stakeholder theory) to improve their approach to the management of their environmental affairs. It is the ability of stakeholders' to influence the decisions of firms that attracted the attention of scholars who later conceptualised stakeholders' pressure as a crucial driver for the implementation of environmental management systems. Firms, in turn, incorporated environmental management into their operations and marketing strategies and used it as a PR tool to showcase their corporate social responsibility. Gradually, the focus shifted towards corporations' economic contributions and their governance structures. It is then that scholars' attention shifted towards corporate sustainability. More recently, scholars have come to realise that the goals of sustainable development are beyond the control of individual corporations. Consequently, the theories of green economics emerged to find a balance between the roles and responsibilities of firms and governments.

2.7.2 Gap #2: There Is a Need for Sustainability Diffusion Theories

The review of sustainability literature also highlighted a wide gap between theory and practice. The number of theoretically grounded sustainability adoption theories, models or frameworks remains alarmingly insufficient despite the rapid growth in the number of empirical studies which investigate sustainability and the implications of its implementation. This particular area of research remains significantly underdeveloped. Although there have been a few attempts by scholars from different disciplines to advance theory building in this area, their contributions offered very little on understanding the factors that influence employees' attitudes towards sustainability and how to maximise the diffusion rate of pro-sustainability behaviours.

The lack of theories that conceptualise the diffusion process of pro-sustainability behaviours was the primary motive for undertaking this research. The author believed that organisations (e.g. UK universities) often know what they should adopt and which sustainability initiatives they should implement, but they do not necessarily know how to influence their employees' attitudes and behavioural intentions in favour of sustainability adoption. This research, therefore, sought to develop a sustainability diffusion model that could be used to bridge the gap between knowing and doing at the organisational level and between attitude and actual behaviour at the individual level.

This research could be the only attempt to develop a sustainability diffusion theory and to conceptualise the factors that influence the rate by which pro-sustainability behaviours are diffused in an organisational context. It is, however, part of a new trend which focuses more on the process of sustainability implementation and less on its outcomes. Several new research areas emerged in recent years such as 'change for sustainability' and 'sustainability transition' which focus primarily on studying the variables that impact on the transition process.

2.7.3 Gap #3: There Is a Need for More Interdisciplinary Research

The number of interdisciplinary research studies in the area of sustainability implementation is noticeably insufficient. Sustainability is a complex construct therefore it needs to be studied interdisciplinarily in order to facilitate broader conceptualisation of its principles, applications and implications. Besides, interdisciplinary research enables researchers to tap into existing knowledge in other research disciplines in order to find appropriate solutions to contemporary research problems. For example, this research conceptualised sustainability as an innovation. Linking sustainability to innovation enabled the author to barrow theories from the diffusion of innovations literature in order to conceptualise the antecedents of sustainability diffusion. The sustainability literature often discusses sustainability as a driver of innovation (e.g. Ceschin and Gaziulusoy, 2016; Sarkar S. and Pansera, 2017) or as an outcome of an innovation process (i.e. eco products & services; sustainable business models; etc.) (Horng et al., 2017; Friedman, 2011), but there have not been any attempts to link the two concepts as theoretical constructs. This research is, therefore, among very few research studies, if not the only study, that conceptualises sustainability as an innovation. It taps into the existing knowledge in three different research disciplines, namely: sustainable management; innovation diffusion; and persuasive communications. It uses Ajzen's (1991) theory of planned behaviour and Rogers' (1962) diffusion of innovations theory as a theoretical foundation for the proposed model.

2.8 Conclusions

Despite the recent developments in the area of sustainability implementation, there is still little guidance in the literature on how sustainability can be successfully diffused at the individual level. Although several sustainability implementation theories had been proposed, researchers have not yet proposed models to help organisations speed up the rate of sustainability diffusion and narrow the gap between what is known and what is put into practice. It remains unclear how sustainability managers or officers should deal with the numerous behavioural challenges during the diffusion of new pro-sustainability initiatives. What is clear is that getting an employee to adopt a pro-sustainability initiative can be very difficult even when it has obvious advantages. This research, therefore, set out to bridge a gap in one of the least understood areas of sustainability implementation, namely: non-adoption.

The next chapter reviews the literature on innovation diffusion in order to clarify; what "innovation" means, its conceptualisation, its characteristics and the different theories that conceptualise its diffusion and implementation.

Chapter III

Literature Review on Innovation Diffusion

3.1 Introduction

This chapter satisfies the second part of a three-part literature review purpose. The previous chapter concluded that although the literature on sustainability implementation was growing, the knowledge on how to diffuse pro-sustainability initiatives/behaviours in the workplace was not. Therefore, the purpose of this chapter is to review the literature on innovation diffusion in order to identify theories, models or frameworks which may be used to explain and conceptualise the process of sustainability diffusion. This research investigates a very specific research subject, namely: sustainability diffusion. Its working hypothesis is that sustainability is an 'innovation'. Therefore, it is necessary to clarify; what 'innovation' means, its conceptualisation, its characteristics, and to identify the different models and theories that conceptualise its diffusion, adoption and implementation.

3.2 Definition of Innovation

Innovation is conceptualised differently by different scholars in different contexts (Edvardsson and Tronvoll, 2013; Bitzer and Bijman, 2015). To this very day, there is no robust consensus in relation to the definition, nature, characteristics, antecedents and determinants of innovation (Hristov and Reynolds, 2015). Some scholars even lost hope in reaching a consensus and encouraged others to focus more on the context-specific nature of innovations and less on the similarity of their conceptualisation (e.g. Wolfe, 1994; Poirier et al., 2015). This is perhaps because, as a concept, innovation is perceived differently depending upon the context in which it is experienced or studied (Lindberg and Säll, 2013). One person may perceive anything that is characterised as creative, genius or groundbreaking to be an innovation, while another may perceive innovation as anything that involves change, regardless of how radical the change is (Szekely and Strebel, 2013). This difference in perception constitutes the foundation of almost all inconsistencies in the innovation diffusion literature.

3.2.1 Innovation versus Invention

Broadly, innovation is conceptualised as anything that is new (Hossain, 2016). These include new products; new services; new structures, new processes, new markets and new business models. This approach to innovation conceptualisation created a new area of disagreement especially in relation to the nature of newness. Different scholars have different opinions of what "new" means in the context of innovation. Some scholars view innovation as anything

that is perceived to be new by the unit of adoption (e.g. Coopey et al., 1998; Van de Ven, 1986; Zaltman et al., 1973), while others argue that "newness" has a much deeper meaning and is much more complex in nature than the simplified generalisations made by their opponents (e.g. Johannessen et al., 2001). Although a minority, there are scholars who believe that incremental change should not be classified as innovation. They argue that it is the magnitude and the degree of risk involved that differentiate change from innovation (McAdam and McClelland, 2002). The more radical the change is, the riskier it becomes and the higher the probability of it being classified as an innovation (Oke, 2007).

Other scholars focused on differentiating innovations from inventions (e.g. Kirton, 1980). Invention is conceptualised as the creation of new ideas, whereas innovation is conceptualised as the commercial exploitation of these ideas (Amabile et al., 1996). In this sense, an invention is the stage that precedes innovation and is a crucial component of the innovation process (Rivett, 1998). Every innovation process begins with the production of novel ideas and ends with the adoption and commercialisation of those ideas (Amabile et al., 1996).

It is common for individuals with little or no knowledge of the scientific nature of innovation to mistake it for an invention (Anthony, 2009). Scientifically, innovation is neither an occasional spark of brilliance nor the mere advent of something new (Refer to Appendix 2.3 for more information on innovation creation). Van de Yen (1999) argued that an idea by itself only constitutes an invention. It only becomes an innovation when it begins to diffuse. According to Van de Yen (1999; p. 9), an invention is "the creation of a new idea, whereas innovation is more encompassing and includes the process of developing and implementing a new idea". This means the term 'innovation' is encompasses some part of the diffusion process.

Some scholars have put forth narrower conceptualisations of innovation, such as Kimberly (1981; p. 671) who believed it "only makes sense to define as innovation those changes which have a substantial impact upon the organization (or subdivision of an organization) into which they are introduced". Kimberley puts the emphasis upon the idea of having been adopted and shown to have an impact rather than just introduced. A similar argument was also made by Ahn et al. (2010; p. 560) who conceptualised innovation as "the capacity to translate invention or insight into commercially valuable goods and services".

Therefore, an invention is anything that has not existed before and has not been exploited in any form or shape (Cohen and Caner, 2016). It only becomes an innovation once it has been operationalised, marketed, diffused and commercially-exploited (Trott, 2008). This does not only apply to products and services, but it also applies to all kinds of inventions such as

management philosophies. A philosophy remains an invention until it becomes of use or of commercial value to the unit of adoption. In this sense, usefulness and commercial value constitute key characteristics that define the basic nature of innovation. This is, of course, contrary to the arguments of many prominent innovation diffusion scholars including Rogers (2003); Damanpour, (1996) and Van de Ven, (1986) who consider perceived "newness" to be the single most important defining characteristic of innovation. This view is shared by several other scholars. Luecke and Katz (2003) referred to innovation as the "successful introduction of a new thing or method". Similarly, Rogers and Shoemaker (1971) stated that as long as the idea is perceived as new by the unit of adoption, it is an innovation. Garcia and Calantone, (2002) also defined innovation as a "good or service that is new or significantly improved".

In an attempt to boost consistency in the research field of innovation diffusion, scholars have clarified some of the characteristics that differentiate one innovation from another. Broadly, three approaches to innovation classification are commonly used by scholars. Innovations are either classified based on their degree of newness (e.g. Koc and Bozdag, 2016), or on their domain of application (e.g. Baba, 2012), or on their attributes (e.g. Kapoor et al., 2014). Appendix 4.1, Appendix 4.2 and Appendix 4.3 discuss these approaches in detail and clarify the conceptual arguments that underlie each approach.

3.2.2 Defining Attributes of Innovation

Studying how the attributes of a particular innovation influence its diffusion pattern is strongly emphasised in the academic literature. Fliegel and Kivlin (1966) were among the first academic scholars who investigated how innovations' attributes influence their diffusion pattern. They argue that studying attributes is essential to understanding the complexity of the diffusion task. Their argument is shared by many innovation diffusion scholars such as Rogers and Shoemaker (1971: p. 137) who believe that it is the "attributes of a new product, not as seen by experts but as perceived by the potential adopters, that really matters". The attributes' research significance stems from their predictive power which can be used to anticipate the rate by which a particular innovation is likely to diffuse. They are considered to be the independent variables that, directly or indirectly, influence the diffusion process of new innovations and the rate by which they are diffused (Rogers, 2003). Hence, understanding innovations' attributes helps academics and practitioners alike to devise appropriate strategies that can create the conditions and the climate needed to achieve an optimal rate of diffusion.

Downs and Mohr (1976) divided innovations' attributes very broadly into primary and secondary attributes. They argued that innovations have inherent attributes that remain constant, unchanged and invariant regardless of the diffusion or adoption context. These are

considered primary attributes. The attributes that change or vary across cases are referred to as secondary attributes. Tornatzky and Klein (1982) disagreed with Downs' and Mohr's propositions and challenged their arguments based on the fact that all attributes are perceptual. Different units of adoption will have a different perception of an innovation and its attributes. Hence, it is inappropriate to categorise innovations on the basis of perceptual attributes that may vary significantly depending upon adopters' characteristics or adoption context.

Innovation diffusion scholars have identified numerous attributes that are believed to impact on the diffusion of new initiatives or behaviours. These attributes include, but not limited to: trialability (Venkatesh et al., 2003; Hoeffler, 2003), subjectively-measured cost (Kuan and Chau, 2001; Premkumar et al., 1997), observability (Astebro and Michela 2005; Cestre and Darmon 1998), communicability (Premkumar et al., 1997; Venkatesh et al., 2003), riskiness (Wejnert, 2002; Boyd and Mason 1999), customisability (Herbig and Day, 1992) and innovativeness (Amasona et al., 2006; Swink, 2003). The frequency by which innovation attributes have been studied in the literature is illustrated in Table III - 1. See Appendix 2 for more information on the defining attributes of innovation and innovation creation.

The Attribute	**Representative Studies**
Trialability	Venkatesh et al., 2003; Hoeffler 2003; Shimp and Bearden 1982; Agarwal and Prasad 1997; Rogers 2003; Holak and Lehmann 1990; Herbig and Day 1992; More 1982; Cestre and Darmon 1998; Venkatraman 1991; Moore and Denbasat 1991; Dearing and Meyer 1994; Meyer et al., 1997; Rogers and Shoemaker 1971; Tornatzky and Klein 1982; Fliegel and Kivlin 1966.
Applicability	Dearing and Meyer 1994
Commutuality	Dearing and Meyer 1994
Cost	Saunders and Clark 1992; Premkumar et al., 1997; Kuan and Chau 2001; Cragg and King 1993; Tornatzky and Klein 1982; Zaltman et al., 1973; Fliegel and Kivlin 1966
Continuous Improvement	Bessant and Caffyn 1997
Centrality	Wolfe 1994; Nord and Tucker 1987
Observability	Venkatesh et al., 2003; Agarwal and Prasad 1997; Moore and Denbasat 1991; Shimp and Bearden 1982; Rogers 2003; Astebro and Michela 2005; Dearing and Meyer 1994; Tornatzky and Klein 1982; Meyer and Goes, 1988; Herbig and Day 1992; Cestre and Darmon 1998; Calantone and Cooper 1981; Venkatraman 1991; Holak 1988; Meyer et al., 1997.
Architectural	Henderson and Clark 1990
Discontinuous	O'Connor 1998; Rice et al., 1998; Lambe and Spekman 1997
Relative Advantage	Venkatraman 1991; Boyd and Mason 1999; Astebro and Michela 2005; Agarwal and Prasad 1997; Henard and Szymanski 2001; Wilson et al., 1999; Adams et al., 1992; Moore and Denbasat 1991; Holak and Lehmann 1990; Cestre and Darmon 1998; Calantone and Cooper 1981; Wejnert 2002; Beatty et al., 2001; Thong 1999; Premkumar et al., 1997; Tornatsky and Klein 1982;

	Rogers 2003; More 1982; Dearing and Meyer 1994; Meyer et al., 1997; Rogers and Shoemaker 1971
Autonomous	Chesborough and Teece 1996; Goodman 1981
Novelty	Danneels and Kleinsehmidt 2001; Avlonitis et al., 2001; West 1990; Heany 1983; Leonard 1998; Krippendorff 1997; Tatikonda and Rosenthal 2000.
Originality	Amabile et al., 1996; Pelz 1985
Reliability	Dearing and Meyer 1994; Tornatzky and Klein 1982
Compatibility	Beatty et al., 2001; Thong 1999; Premkumar et al., 1997; Agarwal and Prasad 1997; Schneider, 2007; Boyne et al., 2005; Tornatsky and Klein 1982; Rogers 2003; Dearing and Meyer 1994; Moore and Denbasat 1991; Venkatesh et al., 2003; More 1982; Holak 1985; Henard and Szymanski 2001; Cestre and Darmon 1998; Aggarwal et al., 1998; Shimp and Bearden 1982; Holak and Lehmann 1990; Herbig and Day 1992; Meyer et al., 1997; Rogers and Shoemaker 1971; Zaltman et al., 1973; Fliegel and Kivlin 1966
Pervasiveness	Becker and Whisler 1973; Wolfe 1994; Tornatzky and Klein 1982; Beyer and Trice 1978
Demonstrability	Agarwal and Prasad 1997; Moore and Benbasat 1991
Visibility	Agarwal and Prasad 1997; Tornatzky and Klein 1982; Moore and Benbasat 1991
Complexity	Beatty et al., 2001; Thong 1999; Premkumar et al., 1997; Agarwal and Prasad 1997; Schneider, 2007; Boyne et al., 2005; Tornatsky and Klein 1982; Rogers 2003; Cestre and Darmon 1998; Gopalkrishnan and Damanpour 1994; Wejnert 2002; Labay and Kinnear 1981; Shimp and Bearden 1982; Boyd and Mason 1999; Herbig and Day 1992; Holak and Lehmann 1990; Cestre and Darmon 1998; Meyer et al., 1997; Dearing and Meyer 1994; Rogers and Shoemaker 1971; Pelz 1985
Flexibility	Wolfe 1994; Tornatzky and Klein 1982
Payoff	Tornatzky and Klein 1982; Fliegel and Kivlin 1966
Profitability	Tornatzky and Klein 1982
Communicability	Premkumar et al., 1997; Venkatesh et al., 2003; Agarwal and Prasad 1997; Venkatesh et al., 2003; Astebro and Michela 2005; Shimp and Bearden 1982; Herbig and Day 1992; Calantone and Cooper 1981; Rogers 2003; Cestre and Darmon 1998; Venkatraman 1991; Holak 1988; Meyer et al., 1997; Rogers 1983; Tornatzky and Klein 1982; Zaltman et al., 1973
Riskiness	Wejnert 2002; Boyd and Mason 1999; Agarwal and Prasad 1997; Cestre and Darmon 1998; Tornatsky and Klein 1982; Holak and Lehmann 1990; Herbig and Day 1992; Aggarwal et al., 1998; Venkatraman 1991; Bommer and Jalajas 1999; Meyer et al., 1997; Taggart and Blaxter 1992; Meyer and Goes 1988.
Uncertainty	Brouwer 2000; Wolfe 1994; Shane 1995; Deyle 1994; Souder and Moenaert 1992; Zaltman et al., 1973
Effectiveness	West and Anderson 1996; West and Farr 1990; Dearing and Meyer 1994; West 1990; Pelz 1985.
Radicalness: Magnitude of Change	West and Anderson 1996; Wilson et al., 1999; Lambe and Spekman 1997; Tornatzky and Klein 1982; Wolfe, 1994; Zaltman et al., 1973; Dearing and Meyer 1994
Reversibility	Zaltman et al 1973
Customisability	Herbig and Day, 1992; Calantone and Cooper 1981; Boyd and Mason 1999.

Mechanical Attraction	Tornatzky and Klein 1982; Fliegel and Kivlin 1966
Revolutionary	Rabson and DeMarco 1999
Innovativeness	Amasona et al., 2006; Swink, 2003; Tepic et al., 2013.
Adaptability	Leonard-Barton and Sinha 1993; Meyer et al 1997; Wolfe, 1994
Instrumental	Wolfe 1994; Zaltman et al., 1973
Divisibility	Tornatzky and Klein 1982; Zaltman et al., 1973; Wolfe, 1994; Dearing and Meyer 1994; Wolfe 1994.
Ease of Use	Agarwal and Prasad 1997; Adams et al., 1992; Moore and Denbasat 1991; Tornatzky and Klein 1982.
Economic Advantage	Dearing and Meyer 1994; Zaltman et al., 1973
Incremental	Damanpour 1996
Scope	Chesborough and Teece 1996; Henderson and Clark 1990
Image/ Prestige	Agarwal and Prasad 1997; Moore and Denbasat 1991; Rogers 2003; Mohr 1969, Wolfe, 1994.
Status	Wolfe 1994; Mohr 1969

Table III - 1: Key Innovation Attributes

3.3 Innovation Diffusion

The diffusion of innovation, as a process, is defined differently by different scholars depending upon the context in which it is studied and upon the theoretical perspectives adopted by the scholars studying it. The academic disciplines to which scholars belong also dictate their conceptualisation of innovation diffusion. The construct has been studied in the context of various academic disciplines which include, but not limited to; psychology, communication, sociology, political science, marketing, anthropology, agricultural economics and education. Each discipline constitutes a context and under each context, innovation diffusion is conceptualised and defined differently. For example, from a social science perspective, Rogers (1995: p. 5) defined innovation diffusion as a "process by which an innovation is communicated through certain channels over time among the members of a social system". From an economic perspective, MacDonald et al. (1983: p. 50) defined it as a "process of spreading information amongst consumers, producers and countries and consequent adoption of changed techniques of consumption, production and trade".

Historically, the innovation diffusion research can be traced back to the early 1900s and more specifically to the work of Tarde (1903). The primary aim of innovation diffusion research is to produce models, theories, frameworks or generalisations that predict, or at least explain, the diffusion behaviour and adoption patterns of new innovations (Wolfe, 1994). Most of the early research focused on the use of hypotheses and relied primarily on deductive approaches to

theory generation. Questionnaires were often used to collect primary data from adopters in order to identify or explain any relationships that exist between the variables being investigated and the rate of innovation diffusion (Rogers, 2003). Archival analysis and expert judgements were also commonly used by early innovation diffusion scholars.

Tarde (1903), as a sociologist, conducted one the first diffusion studies investigating the rate by which new ideas are diffused and adopted. Tarde's study found that new ideas diffused in an observable pattern. The highest rate of diffusion is experienced when the majority of potential adopters embrace the idea or the innovation and begin to adopt it. The diffusion momentum begins to slowdown immediately after the majority of adopters had adopted the idea or innovation (Xiong et al., 2016). Although the curve of diffusion is often S-shaped, its slope varies from one innovation to another. The variation is determined by the innovation's rate of adoption and is contingent upon numerous factors such as the inherent attributes of the innovation and the perceptions of unit(s) of adoption.

The work of Tarde (1903) provided a theoretical foundation and a conceptual basis for almost all innovation diffusion studies that followed suit. For example, a well-known investigation was carried out by Ryan and Gross (1943) in the early 1940s investigating the factors that influence the rate by which hybrid corn seeds are diffused and adopted among Iowa farmers. The investigation reached similar conclusions to those of Tarde (1903). It found that the diffusion of hybrid corn seeds was characterised by the S-shaped curve. Ryan and Gross (1943) also put forth the famous adopter classification which divided innovation adopters into five different categories based upon their adoption behaviour, namely: laggards, late majority, early majority, early adopters and innovators. This approach to adopter classification is still being used today by innovation diffusion researchers.

One of the most influential scholars of innovation diffusion is Everett Rogers who published a book in 1962 titled "Diffusion of Innovations" in which the various factors that influence the rate of innovation diffusion were explained in detail. Although Rogers' work focused primarily on rural sociology, the conclusions were applicable to a variety of research fields. Rogers' work evolved over the years and new ideas were incorporated into the initial propositions such as the fact that the diffusion process is neither linear nor instantaneous (Rogers, 2003). It is now understood that the diffusion process of innovation can be rather complex as it is influenced by numerous factors and involves human interactions between innovators and the units of adoption which in turn requires the development of many interpersonal relationships in order to create a positive environment that is conducive to the diffusion of innovations (Dodgson and Bessant, 1996). Hence, more recent studies have encouraged scholars to

consider how the contexts (e.g. organisational context) in which innovations are diffused might influence the rate of their diffusion and ultimately their adoption and operationalisation (e.g. Fitgerald et al 2002; Abdul Hameed et al., 2012; Fuentelsaz et al 2016).

There are some studies that went far enough to investigate the impact national context has on the innovation adoption process. Most of these studies were, however, targeted towards public sector organisations (e.g. Bartlett and Dibbens, 2002; Van der Boor et al 2014; Suzuki, 2015).

It is notable that there is no single, commanding theory of innovation diffusion in the literature. In fact, there are several theories of innovation diffusion that provide distinctively different perspectives on the process of innovation diffusion. The diffusion research is very diverse and it investigates the diffusion process in a broad range of contexts from private to public; service to manufacturing, technical to administrative and operational to organisational. However, many of the theories and conceptual models are either discipline-specific or are oriented towards a particular type of innovation. For example, the work of Cooper and Zmud (1990) focused primarily on the field of science and technology and specifically on the diffusion of IT-related innovations. Their diffusion model explains the diffusion pattern of IS and divides the diffusion process into six core stages, namely: Initiation, Adoption, Adaption, Acceptance, Routinisation and Infusion.

Table III -2 illustrates the academic disciplines that have contributed significantly to the field of innovation diffusion.

	Area of Contribution
Technology	The path dependency of diffusion processes (e.g. Arthur et al., 1987; Thrane et al., 2010); the transfer and diffusion of technology in organisations (e.g. Lowe and Crawford, 1984; Liu and Liang, 2013; Rogers, 1995; Eveland, 1986; Ungureanu et al., 2016); the diffusion of complex technologies (e.g. Tornatzky and Fleischer, 1990; Kamaruddin and Udin, 2009; Behkami and Daim, 2016); and understanding the advent of technological innovations (e.g. Zmud, 1984; Chau and Tam, 2000; Huang et al., 2016).
Management	Organisational learning and organisations' innovativeness (e.g. Van de Ven and Polley, 1992; Attewell, 1992; Westerlund and Rajala, 2010; Zeng et al., 2015); innovation adoption in organisations (e.g. Tabak and Barr, 1998; Damanpour and Gopalakrishnan, 2001; Germain, 1996; Gopalakrishnan and Damanpour, 2000; Kim, 2015); innovation adoption and business performance (e.g. Marinova, 2004; Damanpour and Gopalakrishnan, 2001; Löfsten, 2014); organisational change and innovation (e.g. Martin-Rios, 2016); drivers of innovation adoption (e.g. Damanpour and Gopalakrishnan, 2001; Pierpaoli et al., 2013).
Psychology	Innovation adoption and organisational change (e.g. West and Farr, 1990; Becker, 2010; Martin-Rios, 2016); adopters' attitude to innovation and change (e.g. West, 1987; Noppers et al 2015); the role of managers in innovation diffusion (e.g. Gagnon and Toulouse, 1996; Basile and Faraci, 2015); innovation

	adoption and behaviour change (e.g. Van Rijnsoever and Oppewal, 2012; Tigabu et al., 2015; Miranda and Lima, 2013); cognitive theories of creativity (e.g. Kirton, 2003; Amabile, 1988; Au and Enderwick, 2000; Heidenreich et al., 2016).
Sociology	Innovation attributes (e.g. Zaltman et al., 1973; Häggman, 2009; Tornatzky and Klein, 1982; Rogers, 2003; Kapoor et al., 2014; Wilson et al., 1999; Van Rijnsoever et al., 2009); characteristics of unit(s) of adoption (e.g. Warren et al., 1988; Reinhardt and Gurtner, 2015; Rogers, 2003; Jahanmir and Lages, 2016); the innovation decision process (e.g. Rogers, 2003; Seligman, 2006; Clark et al., 1993); rate of innovation diffusion (e.g. Van de Ven and Rogers, 1988; Rogers, 2003; Fallan, 2015; Rogers and Shoemaker, 1971; Hivner et al., 2003).
Economics	Intra-organisational diffusion of innovations (e.g. Levin et al., 1992; Battisti and Iona, 2009; Jensen, 2001; Hollenstein and Woerter, 2008); national and regional innovation clusters (e.g. Yıldız and Aykanat, 2015); SMEs and the advent of technological innovations (e.g. Abd Aziz and Samad, 2016; Minna, 2014); economic drivers of innovation diffusion (e.g. Pierpaoli et al., 2013); innovation and economic contribution (e.g. Idun and Aboagye, 2014; Colino et al., 2014).
Social Anthropology	Community-specific studies of innovation diffusion (e.g. Gamella, 1994; Sorenson et al., 2013; Acheson and Reidman, 1982; Goswami and Choudhury, 2015); socio-cultural contexts and innovation adoption decisions (e. g. Kim and Park, 2011; Desmarchelier and Fang, 2016); culture and technology adoption (e.g. Caccia-Bava et al., 2013; Pfaffenberger, 1992; Haapaniemi and Mäkinen, 2009)
Marketing	Consumer innovation adoption behaviour (e.g. Arts et al., 2011; Bhoovaraghavan et al., 1996; Jansson et al., 2010); culture and innovation adoption (e.g. Chao et al., 2013; Singh, 2006); new product diffusion (e.g. Van den Bulte, 2000; Yalcinkaya, 2008; Nijssen and Frambach, 2000; Lee et al., 2015); innovation diffusion in new markets (e. g. Hart and Tzokas, 2000; Allaway et al., 1994; Fenech, 2013); and categorisation of new product adopters (e. g. Lee et al., 2005; Mahajan et al., 1990; Ozdemir et al., 2008).

Table III - 2: The Academic Disciplines of Innovation Diffusion Research

3.4 Theories and Models of Innovation Diffusion

This section provides an overview of selected few models and theories of innovation diffusion. The reviewed models/theories were selected on the basis of their popularity, empirical validity and most importantly on the basis of their relevance to the subjects under investigation.

3.4.1 Rogers (1962) Diffusion of Innovations Theory

Rogers' theory is one of the most commonly quoted theories in the innovation diffusion literature. Rogers defined innovation diffusion as a "process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1983: p. 5). The theory conceptualises the factors that influence the adoption decisions of new innovations among individuals, groups and organisations. It is one of the very few theories that examine the rate of innovation adoption and the factors that influence it. Rogers (2003) referred to the "rate of adoption" as the speed with which an innovation is adopted by members of a social system. Rogers' theory purports that the rate of innovation

adoption is determined by five variables; namely, the perceived attributes of the innovation, the nature of the social system, the type of communication channels, the type of innovation decision and the promotion efforts of change agents.

There are many innovation diffusion studies in the literature that were primarily inspired by Rogers' (1962) theory (e.g. Ramamurthy and Premkumar, 1995; Brancheau and Wetherbe, 1990; Mustonen-Ollila and Lyytinen, 2003; Dibra, 2015; Li S.S. and Huang, 2016). For example, Ramamurthy and Premkumar (1995) investigated the innovation-specific and organisation-specific factors that influence the rate by which Electronic Data Interchange innovations were diffused in organisations. They used Rogers' theory as a theoretical foundation for their research and found that the perceived relative advantage and compatibility were significant predictors of EDI diffusion in organisations. Similarly, a longitudinal study by Mustonen-Ollila and Lyytinen (2003) investigated the adoption of information systems in three organisations and found that adoption decisions were significantly influenced by perceived easiness/complexity, trialability and the past experiences of organisational members. Appendix 2.2 provides more examples of empirical studies that appear to have adopted, partially or fully, Rogers' approach to studying innovations' attributes and their impact on diffusion processes.

However, there are some scholars who raised some concerns about the use of Rogers' (1962) DOI theory especially in investigations that look into the diffusion of complex technological innovations. For example, Cooper and Zmud (1990) argued against the use of Rogers' innovation-decision process model in investigating technological innovations because it, allegedly, fails to take the non-sequential and nonlinear nature of the diffusion process into account. Similarly, Tornatzky and Fleischer (1990) complained about the inability of Rogers' DOI theory to provide a detailed explanation of all the possible factors that influence the diffusion and adoption of complex technological innovations.

Unlike other innovations, the diffusion of technological innovations is not always rationalistic and is influenced by a broad range of factors, some of which transcend beyond organisational boundaries such as culture and politics. It is for this reason that Tornatzky and Fleischer (1990) and some other scholars believe that Rogers' theory is not rigorous enough, from an analytical perspective, to provide an in-depth understanding of the factors that underlie the diffusion and adoption of complex technological innovations by individuals, groups or organisations. This argument was supported by Orlikowski (1993) and Chau and Tam (1997).

Additionally, Orlikowski (1993) argued that Rogers' (1983) innovation-decision process model is oriented primarily towards individuals and fails to adequately consider how the environmental context and organisation-specific realities impact on the diffusion process of technological innovations. Hence, Rogers' theory is perceived to be lacking the indicators and constructs needed to predict the diffusion of complex technological innovations in organisations. Similarly, Chau and Tam (1997) claimed that Rogers' theory failed to consider the impact of the environment and the context in which innovations were diffused on different units of analysis and how it influenced the outcomes of diffusion processes. They argued that the theory was more concerned about the classification of different adopters and their perceptions of different innovation attributes and was less concerned with the broader context.

3.4.2 Davis (1989) Technology Acceptance Model

The technology acceptance model or TAM is a popular model of innovation diffusion, especially among researchers who study the adoption and implementation of IT-related innovations. It is commonly used as a theoretical framework to highlight the factors that have a direct influence on the acceptance and operationalisation of new technologies (Hsieh and Wang, 2007; Chauhan, 2015). The model is used to predict and explain the adoption of technological innovations in different contexts. It is conceptually-founded on the assumption that individuals' adoption intentions and behaviours are shaped by their attitudes and beliefs. It comprises six core constructs; namely, behaviour, behavioural intentions, attitude, perceived usefulness, perceived ease of use, and external variables (Ratten, 2015). It claims that individuals' attitude towards the adoption and use of technological innovations is influenced by their perceptions of the innovations' usefulness and ease of use. The more positive individuals' perceptions of an innovation's ease of use and usefulness are, the more favourable their attitude towards its adoption is and the higher their behavioural intentions to accept and use the innovation become.

There are numerous studies in the literature that have employed TAM as a theoretical foundation for their research investigations (e.g. Hsieh and Wang, 2007; Pinho and Soares, 2011; Ooi and Tan, 2016). Hsieh and Wang (2007) used TAM to identify and study the factors that impact on the acceptance and use of complex IT systems in organisations. Their investigation found that a system's perceived usefulness and perceived ease of use were very significant predictors of its adoption, implementation and operationalisation. Similarly, a study by Pinho and Soares (2011) investigated the adoption of social networking technologies and found that TAM had a high explanatory power of individuals' attitudes towards social networking technologies and their intentions to adopt and use the technologies under study.

The perceived ease of use and perceived usefulness were found to largely predict individuals' attitudes and behavioural intentions.

However, despite its popularity, TAM was criticised for its inability to provide practical solutions to non-adoption (e.g. Wixom and Todd, 2005; Venkatesh et al., 2003). It does not clarify how the acceptance, adoption and use of technological innovations can be increased, for example, through design, re-invention or reconfiguration. The model also fails to capture the social and dynamic nature of diffusion processes, especially in the context of complex technological innovations (Schwarz and Chin, 2007). Additionally, it only focuses on the behavioural factors that influence the acceptance of innovations but fails to pay sufficient attention to other innovation-specific, organisation-specific and context-specific factors. In other words, it focuses more on the attitudes and behaviours of adopters and less on the innovation itself and the context in which it is diffused and adopted.

3.4.3 Venkatesh et al. (2003) Unified Theory of Acceptance and Use of Technology

The unified theory of acceptance and use of technology or UTAUT was introduced by Venkatesh et al. (2003) as an improved extension of TAM. The extended model is intended to provide a clearer understanding and a richer explanation for the adoption process of technological innovations. Several new constructs and variables were incorporated into the original TAM. Social influence, facilitating conditions, perceived ease of use and perceived usefulness have become the core constructs in the new model. The terminologies used in the original model were altered slightly. Perceived ease of use has become "effort expectancy", while perceived usefulness was changed to "performance expectancy".

In UTAUT, the impact of four constructs on users' behavioural intentions is moderated by four key variables, namely: voluntariness of use, experience, age and gender (Nair et al., 2015). These changes have helped to boost the predictive power of the original TAM and shift its focus from behavioural intentions towards the post-adoptive use of technological innovations. In other words, UTAUT is more concerned about the actual use of an innovation than the behavioural intentions of potential adopters. This is because the new model assumes that people's cognitive processes which underlie their reasoning and decision-making activities are affected by four factors, namely: social influence, effort expectancy, performance expectancy and the conditions under which the innovation is adopted (Zuiderwijk et al., 2015). These factors combined determine not only individuals' behavioural intentions to adopt a particular innovation, but also their willingness to operationalise it or put it into action.

However, despite the improvements in its predictive power, UTAUT inherited some of the conceptual issues found in the original TAM. For example, UTAUT does not provide clear and practical solutions to problems of non-acceptance or non-adoption. It does not help those in charge of technology implementation to devise appropriate interventions to boost acceptance and improve its chances of success (Brown et al., 2010).

3.4.4 Tornatzky and Fleischer (1990) Technology Organisation Environment

The TOE framework was introduced by Tornatzky and Fleischer (1990) in an attempt to overcome some of the conceptual weaknesses found in Rogers' (1983) innovation-decision process model. The framework conceptualises the relationship between macro and micro environmental conditions and the diffusion of technological innovations in organisations. It is founded on the argument that the diffusion and adoption of technological innovations are not only influenced by internal organisational considerations (i.e. micro conditions), but also by variables that are external to the organisation (i.e. macro conditions). The framework divides the factors that influence the adoption decisions of new innovations into three broad categories, namely: environmental, organisational and technological (Ramdani et al., 2013). Each of these categories encompasses a number of variables that affect the effectiveness by which new innovations are communicated within a particular social system and the speed by which the innovation is accepted and adopted by members of that social system.

The TOE framework has received a lot of attention from innovation diffusion researchers (e.g. Zhu et al., 2006; Salwani et al., 2009; Dedrick and West, 2003; Wang et al., 2016). For example, Zhu et al. (2006) used the framework to investigate the organisational and environmental factors that influence the diffusion and adoption of information systems in organisations. It helped them identify a number of antecedent factors that have a significant influence on the outcome of diffusion processes. Generally, the framework is praised for its usefulness and practicality. Dedrick and West (2003) argued that one of the strengths of the TOE framework is its ability to differentiate between an innovation's inherent attributes and the organisational and environmental contexts in which an innovation is diffused and their distinctive relatedness to the outcome of diffusion and adoption processes.

However, like other theories of innovation diffusion, the TOE framework received strong criticism in relation to its conceptual foundation and the structural relationships that exist between its different constructs. The number of constructs incorporated into the architecture of the model is considered to be an insufficient representation of all the potentially significant factors that influence the adoption and implementation of technological innovations in organisations. Dedrick and West (2003) argued that although TOE framework is a useful

analytical tool, it lacks the level of comprehensiveness needed to develop a theory, model or framework that represents most, if not all, the factors that have a direct or an indirect impact on the diffusion of technological innovations in organisational social systems.

3.4.5 Cooper and Zmud (1990) SIX-Stage Model of Implementation

A six-stage sequential model of innovation implementation was introduced by Cooper and Zmud (1990). The model uses the organisation as the primary unit of analysis and conceptualises the process through which an innovation is diffused and adopted by members of the organisational social system. Its architecture is based on the assumption that the diffusion of information technologies occurs in six sequential stages, namely: initiation, adoption, adaptation, acceptance, routinisation and infusion. It is seen as an attempt to improve earlier models of innovation diffusion such as those of Rogers (1983) and Pierce and Delbecq (1977) whose models are also sequential and linear in nature and comprise of similar stages, but the terminologies used are slightly different.

However, despite its theoretical robustness, the model has several conceptual weaknesses. It fails to consider how the socio-cultural factors influence the diffusion process especially since innovation adoption often occurs within specific social systems. It is not clear how organisation's social contexts and cultures affect the process and the outcome of innovation implementation. Also, the model focuses more on the organisation-specific factors and less on the individual-specific and innovation-specific factors. It fails to pay adequate attention to how individuals' characteristics and innovations' attributes affect the implementation process.

3.4.6 DeLone and McLean (2003) Information System's Success Model

DeLone and McLean (2003) introduced a model that highlights the factors which are critical for successful diffusion of information systems. The model comprises of six interrelated and interdependent constructs, namely: member satisfaction; service quality; information quality; intention to use; system quality; and net benefits (Xinli, 2015). Each construct correlates, either directly or indirectly, with successful implementation of information systems in organisations. The model is founded on the argument that individuals are likely to use a system that is perceived to satisfy their expectations in relation to service quality, information quality and system quality and whose net benefits are observable (Hussein et al., 2007).

However, although the model provides a practical view of some of the factors that influence the implementation of information systems, it has several conceptual weaknesses. Firstly, it fails to consider the complex nature of innovation diffusion processes. It appears to assume that the implementation process of information systems is simple and straightforward. This

cannot be further from reality. The diffusion of technological innovation can be very complicated and its success can depend on numerous related, nonrelated and interrelated variables (Newman and Robey, 1992).

Secondly, the model does not take into account the socio-cultural nature of innovation diffusion. Innovations are diffused with social systems whose characteristics are often specific in nature and have a distinctive impact on the process and outcome of innovation diffusion (Troshani and Doolin, 2007). DeLone and McLean's (2003) failure to conceptualise information systems' diffusion in the context of organisations' social systems raises serious concerns about the model's ability to capture the very essence of innovation diffusion - that is the actions and reaction of organisational members.

3.4.7 Bass (1969) Model of Diffusion

Bass (1969) introduced an innovation diffusion model that illustrates how the timing of an innovation's launch can influence the rate, scale and magnitude of its adoption. The model is oriented towards understanding consumers' behaviours and their decisions to purchase new products (Park and Choi, 2016). It is founded on the argument that the timing of a person's decision to purchase a new product is dependent on the number of previous buyers. In other words, the higher the number of previous buyers is, the earlier purchase decisions are made. The model, therefore, is considered a powerful projection tool that can be used to predict the timing and the scale of sales volumes when launching new products.

Bass' model is one of the most popular models of innovation diffusion in the field of management sciences. It is the practicality of the model that has made it very popular among academics and practitioners alike. The model was widely tested in real-life contexts and its results were often found to be convincingly significant (e.g. Hsiao et al., 2009). The diffusion curves of new products' uptake drawn using Bass' model are found to be much more consistent with the realities of slow uptake and product saturation when demand increases than those drawn using other models of innovation diffusion (Massiani, 2012).

However, despite its practicality, the model received some criticism especially in relation to its conceptual comprehensiveness. For example, the model was criticised for the lack of explanatory variables that can help explain how the diffusion context affect the rate and magnitude of a product's uptake. It does not clarify how a product's price or a firm's marketing efforts affect the diffusion curve (Massiani and Gohs, 2015). Additionally, the model fails to pay adequate attention to the micro and macro factors that influence individuals' behaviours

and their purchase decisions. It does not help clarify how a person's inherent characteristics (e.g. innovativeness) can be manipulated in favour of early product adoption.

3.4.8 Bagozzi and Lee (1999) Innovations' Resistance and Acceptance Model

Bagozzi and Lee (1999) developed a model that conceptualises the factors that support and/or hinder diffusion of new innovations. It focuses on the decision-making process and what motivates an individual to accept or reject a particular innovation. It divides the decision-making process into two sub-processes, namely: goal-setting and goal-striving. The goal-setting process is concerned with the interpretation and evaluation of innovation-related information in order to make informed decisions on whether to adopt or reject a particular innovation. In contrast, the goal-striving is concerned with planning and execution of implementation tactics and strategies in order to achieve a pre-determined goal. The two processes combined shape individuals' experience when making adoption/rejection decisions.

3.4.9 Kleijnen et al. (2009) Innovation Resistance Hierarchy

Kleijnen et al. (2009) introduced a model that conceptualises the sources and potential outcomes of innovation resistance. Although the model is not as comprehensive as many of the other innovation diffusion and innovation resistance models, it makes a valuable contribution to the diffusion debate because it does not conceptualise innovation resistance merely as "non-adoption". Instead, the model conceptualises resistance as a hierarchical construct that can take one of three forms, namely: opposition, postponement and rejection (Kleijnen et al., 2009).

Postponement is seen as the least hindering form of resistance because postponement indicates that the potential adopters do not perceive the innovation negatively, but the proposed timing of adoption is possibly perceived unfavourably. In other words, postponement means that potential adopters accept the innovation, but a decision to adopt it could not be made at the time of introduction. Rejection is much more problematic than postponement (Kleijnen et al., 2009). Rejection is an outcome of, somewhat, an informed decision about the innovation and its attributes. Potential adopters will only decide to reject an innovation after they have evaluated its attributes against their needs and expectations. Opposition is the most severe form of innovation resistance. Opposition is greatly problematic because potential adopters are not only convinced that the innovation is inconsistent with their needs and expectations, but also feel the need that others should know its drawbacks and the implications of its adoption (Kleijnen et al., 2009). In other words, opposition often leads to the creation of anti-innovation campaigns that attack the very philosophical foundations of the innovation and its attributes.

3.4.10 Ram (1987) Innovation Resistance Model

Ram (1987) introduced a model that conceptualises innovation resistance in the context of consumers. The model divides the factors that contribute to innovation resistance into three groups, namely: innovation propagation mechanisms; consumer characteristics and innovation characteristics. Ram (1987) argued that the effectiveness by which an innovation is propagated influences consumers' perception of the innovation, its attributes and their adoption or rejection decisions. Ram also argued that consumers' psychological and demographic characteristics have a direct impact on their acceptance or resistance decisions. An innovation's attributes must be consistent with consumers' characteristics in order to mitigate or eliminate the risk of resistance. The higher the level of inconsistency between the two constructs is, the more likely the innovation will face stiff resistance from potential adopters (Laukkanen, 2016).

3.4.11 Klein and Sorra (1996) Innovation Implementation Effectiveness Model

The innovation implementation effectiveness model was first introduced by Klein and Sorra in 1996. The model conceptualises the key factors that determine the effectiveness of innovation implementation processes. The factors are divided into two broad categories; namely, innovation-values fit factors and implementation climate factors. Klein and Sorra (1996; p. 1063) defined implementation climate as "targeted employees' shared summary perceptions of the extent to which their use of a specific innovation is rewarded, supported and expected within an organisation", and defined innovation-values fit as "the extent to which targeted users perceive that use of the innovation will foster the fulfilment of their values".

Several studies have used Klein and Sorra's (1996) model to investigate the determinants of effective innovation implementation (e.g. Dong et al., 2008; Holahan et al., 2004). Dong et al., (2008) used the model to study the variables that affect the effectiveness by which large-scale administrative innovations are implemented. The model was found to be very useful as it offered a novel way of conceptualising and understanding organisational change. Unlike the traditional change management theories, the model goes beyond the descriptive analysis of organisational change and offers a much thorough theoretical view of innovation implementation. Similarly, Holahan et al. (2004) used the model to study the relationship between innovation-values fit and implementation climate and their impact on the effectiveness of computer technology implementation.

Overall, the model adds value to both, academics and practitioners. In terms of academics, it provides researchers with a strong theoretical foundation on which they can base their own conceptual assumptions especially those related to the implementation effectiveness of

innovations. It is claimed that the model provides a more intuitive conceptualisation of innovation implementation than some the theories/models that preceded it such as the technology acceptance model or TAM which was introduced by Davis, (1989). In terms of practitioners, the model incorporates several key factors whose interrelationships provide a practical and a deep understanding of why the implementation efforts of some innovations succeed, while others' fail.

3.5 Conclusions

Innovation diffusion theories allow researchers to investigate the shape, rate and pattern of innovation diffusion with a focus on a particular unit of adoption, be it an individual or an organisation. The use of such theories to investigate sustainability adoption facilitates the identification of innovation-specific or organisation-specific factors that influence the pattern and the rate by which innovations are diffused and adopted. The identification of these factors is crucial to develop a framework that can act as a predictor of sustainability adoption. The adoption phenomenon of sustainability occurs within the boundaries of a social system. A social system is defined as "a set of people with a shared sense of commonality who tend to interact over time" (Makkonen and Johnston, 2014; p. 325). The theories of innovation diffusion claim that an innovation adoption is an ongoing macro-level social process in which the unit of adoption (e.g. employee) is continually affected by social influences. Therefore, organisations need to understand both, the micro- and macro-level factors that influence employees' adoption decisions in order to have the necessary behavioural control mechanisms in place that are needed to facilitate effective diffusion processes.

There are several diffusion theories that can be used to understand the adoption phenomenon of sustainability. These include but not limited to; Rogers (1962) Innovation Diffusion Theory, Cooper and Zmud (1990) SIX-Stage Model of Implementation, Klein et al., (2001) Innovation Implementation Effectiveness Model, Nolan (1993) Institutional Adoption of Innovations Model and Davis (1989) Technology Acceptance Model. Each of these theories has something to offer in relation to understanding the factors that influence individuals' innovation adoption decision. However, not all of them provide an explanation as to how the rate of sustainability diffusion can be increased. Very few of these theories highlight the key factors that influence the pattern, speed and success of innovation diffusion processes.

Rogers' (1962) Diffusion of Innovations Theory is one of the most commonly quoted theories in the innovation diffusion literature. Rogers' diffusion model is one of very few models that examine the rate of innovation adoption and the factors that influence it. Rogers (2003) referred to the 'rate of adoption' as the speed with which an innovation is adopted by members

of a social system. Rogers' (1983) theory argues that the rate of innovation adoption is determined by five variables; namely, the perceived attributes of the innovation, the nature of the social system, the type of communication channels, the type of innovation decision and the promotion efforts of change agents. The theory also argues that a decision-making unit (e.g. employee) passes through five stages; from initial knowledge of the innovation to forming an attitude about the innovation, to deciding on whether to adopt/reject the innovation, to the implementation of the innovation and to the confirmation of the adoption decision.

Although Rogers' (1962) theory is considered to be a robust theoretical foundation, it was my belief that the theoretical foundation of this thesis can be made even more robust if Rogers' (1983) innovation-decision process model is merged with other behavioural management theories such as Ajzen's (1991) Theory of Planned Behaviour. Therefore, the next chapter presents a review of the persuasive communication literature and provides an overview of the different behavioural management theories that can be used to conceptualise the diffusion of sustainability. It also explains how the predictive power of both, Rogers' (1962) and Ajzen's (1991) theories can be significantly improved if the two theories are merged.

Chapter IV

Literature Review on Persuasive Communication

4.1 Introduction

This chapter satisfies the third part of a three-part literature review purpose. Understanding how individuals were persuaded to perform a particular behaviour or take a specific action was crucial for the development of a model that could effectively conceptualise people's attitudes to sustainability and their adoption intentions. More importantly, the author needed to find a theory, a model or a framework that could be used in conjunction with Rogers' (1962) theory to build a more robust theoretical foundation for the proposed sustainability diffusion model. Therefore, the purpose of this chapter is to review the literature on the subject of persuasion, and to identify different models and theories which may be used to conceptualise persuasion and the factors that influence people's attitudes, intentions and ultimately their behaviours.

The previous chapter concluded that that Rogers' (1962) diffusion of innovations theory alone was not enough and could not conceptualise all of the important factors that influence people's attitudes towards the adoption of pro-sustainability behaviours. It needed to be used in conjunction with other behavioural management theories in order to create a far more robust theoretical foundation for the proposed sustainability diffusion model. The persuasion literature offered a solution to this particular problem. Theories of persuasive communication conceptualise and explain the factors that "cause a person or group to adopt as their own a product, person, idea, entity, or point of view that the person would otherwise not support" (Preston, 2005, p. 294). This chapter, therefore, thoroughly reviews the persuasion literature and identifies the theories and models whose propositions are consistent with Rogers' (1962) theory and particularly with Rogers' innovation-decision decision process model.

4.2 Persuasion

Persuasion is generally understood as a form of communication that comprises four key elements, namely: a source, a message, a channel and a receiver (Wasike, 2017). The source is the initiator of the act of communication (Penczynski, 2016). In initiating the communication, the source hopes that the receiver will comply as desired (Ngamvichaikit and Beise-Zee, 2014). The "message" is one of the significant means through which the receiver is induced to respond as planned or desired (Lewis et al., 2015). For the receivers to respond favourably to the persuasive efforts of the source, the message must affect one or more of their attitude components, namely: cognitive, affective and behaviour (Pappas et al., 2016). Hence, the

content of a message and the way it is designed are very important when engaging in persuasive communication. In fact, the question of how a message might be designed to produce the greatest sensory impact is at the very heart of persuasive communication research.

According to Perloff (1993), the design of persuasive messages has to accommodate for the needs and expectations of a variety of "receiver" groups. Perloff divided receivers broadly into three groups. The first group is interested primarily in the content of the message itself, whereas the second group pays greater attention to the structure of the message. Differently, the third group concentrate primarily on the language of the message such as the use of rhetorical devices. However, the search for evidence is what unites these groups. The use of evidence is one approach of creating a persuasive message to underpin a source statement. Evidence is assertions which stem from another person or corporate body than the communicator of the persuasive message. In other words, the actual communicators use a statement, fact, or object not produced by them in order to enhance their own persuasive messages. Those third party communicators can be for instance endorsers (e.g. famous actors, experts, or everyday users), factual statements (e.g. conveyed by spokesmen), or statistics.

4.2.1 Attitude and Persuasion

After briefly introducing the elements which play a role in the effectiveness of a persuasive process, the next step is to look at the goal of persuasion. The aim of persuasion processes is to change a receiver's attitude or behaviour regarding a particular subject. Perloff, (2003, p. 304) referred to persuasive processes as "systematic, organised efforts to mould health or social attitudes through the use of communication". Therefore, it is important to understand which role attitudes exactly play in persuasive communication and comprehend its nature.

The concept of "attitude" belongs to many diverse areas ranging from industrial psychology and marketing to social psychology. The meaning of the term "attitude" has been the subject of extended debate in psychology. A key focus in this debate has been that of definition. There are scholars who see attitude as purely a descriptive term implying the probability of behaviour toward or away from an object (e.g. Li et al 2015); scholars who see attitude as a latent mediating process which resides deep within a person's personality which determines response (e.g. Wang, 2016); and there are scholars who see attitude as representing only the affective, cognitive or behavioural components (e.g. Bhanthumnavin and Bhanthumnavin, 2014).

The search for scientific accuracy and respectability for the attitude concept has resulted in a variety of definitions and characteristics, together with several techniques for its measurement. For example, Eagly and Chaiken (1993; p. 1) defined attitude as "a psychological tendency

that is expressed by evaluating a particular entity with some degree of favour or disfavour", while Tormala (2016; p. 6) defined it slightly differently as "one's evaluation of something - for example, the extent to which one favours a brand, likes a product or supports a political candidate". A much more thorough definition of attitude was provided by Fishbein and Ajzen (1975, p. 6) who conceptualised the construct as "a learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object". This definition and view of attitude link conceptually to that of the concept of transference as transference is a behavioural outcome of an attitude towards an object. Transference has within it a notion of set, readiness to act, a physiological basis and a degree of permanence. Additionally, it is learned and is evaluative in nature. See Appendix 3.1 for more information on the relationship between attitude and persuasion.

4.2.2 Attitude and Intention

A change in people's attitudes towards a sustainability initiative often has a positive impact on their intentions to adopt or embrace that initiative. Intentions are functions of two factors. The first is concerned with the personal attitude of the individual toward the behaviour in question (e.g. attitude towards sustainability adoption) (Goh et al., 2017). The second is concerned with the subjective norms that exist in the persuadee's social environment (Goh et al., 2017). The former are evaluations or judgments regarding an intended behaviour (e.g. adopting a particular sustainability initiative" is good/bad). The latter refers to the perceived and anticipated reactions and responses the personal environment of an individual utters with regard to the intended behaviour (e.g. sustainability is encouraged/discouraged by superiors). See Appendix 3.2 for more information on the relationship between attitude and intention.

4.2.3 Attitude and Actualisation of Behaviours

The primary goal of any persuasion process is to convince an individual to take a certain course of action or perform a particular behaviour (e.g. embrace sustainability). This goal is achieved by not only changing people's attitudes towards the behaviour but also by maximising their intentions to embrace and actualise that behaviour. In fact, a "person's intention is determined by three factors, namely: (1) attitude; (2) subjective norm; and (3) perceived behavioural control" (Ajzen, 1991). Intention, therefore, mediates the relationship between these three factors and the actual behaviour.

Attitude toward a behaviour is determined by behavioural beliefs, which are in turn determined by two factors, namely: (1) salient beliefs about how likely the behaviour will bring about a positive or negative outcome; and (2) the degree to which the outcome will be evaluated as

positive or negative (Chan et al., 2015). Subjective norm is determined by normative beliefs, which are in turn determined by two factors, namely: (1) salient beliefs about social pressure from significant others on performing the behaviour; and (2) the motivation to comply with other people's opinions (Han, 2015). Perceived behavioural control is determined by control beliefs, which are in turn determined by two factors, namely: (1) salient beliefs about how often inhibiting factors are encountered and (2) how likely these inhibiting factors will be overcome (Phipps et al., 2015). See Appendix 3.3 for more information on the relationship between attitude and behaviour.

4.3 Theories of Persuasion

Decision-making is one of the foundations of many behavioural management theories and provides an avenue for persuasive communications to affect beliefs, attitudes and behaviours. Therefore, developing effective persuasion is of high importance especially for sustainability managers or consultants interested in shaping people's attitudes and behaviours in the workplace. Several models and theories of persuasion have been proposed by scholars from different academic disciplines to help understand how persuasion works within the decision-making process. This section provides an overview of some, but not all, of these theories. It focuses primarily on the theories that scholars believe to be the most reliable based on their empirical validity, the most popular, and the most relevant to this research study.

4.3.1 The Elaboration Likelihood Model (ELM)

The elaboration likelihood model was first introduced by Petty and Cacioppo in 1986. The ELM describes the process of possible attitude, opinion, or behaviour change as a consequence of a persuasive message. It "provides a fairly general framework for organising, categorising and understanding the basic processes underlying the effectiveness of persuasive communication" (Petty and Cacioppo, 1986; p. 125). ELM is a dual-process theory of persuasion, which means that in the one hand it relies on fast, frugal heuristics at the unconscious level and in the other on slow, effortful reasoning at the conscious level. Hence, the model is seen as an attempt to integrate contrary research findings and theoretical movements into one broad concept. The main assumption of the ELM is that the level of elaboration of a received persuasive message can vary depending on several factors. Examples for these factors are internal factors of the message or individual statuses of being the receiver. These factors determine to what extent a receiver engages in processing the message. Hence, the likelihood of the receiver being persuaded may vary from one situation to another.

Despite its popularity, the ELM has been criticised in a number of areas. Firstly, Hamilton et al. (1993; p. 63) criticised the model for failing to add a significant value to persuasion theory stating that "current model of the peripheral route is logically inconsistent with the mode for the central route due to its reliance on heuristics rather than rule-based reflection". Secondly, Stiff (1986; p. 77) criticised the model for focusing on individual strategies to process information while relying heavily on "unchecked assumptions about individuals' abilities to process information". Stiff described the processing of persuasive messages as a choice between two strategies (i.e. the central or the peripheral route). Stiff, therefore, complained about the lack of a simultaneous processing which allows for both processes happening at the same time. This makes persuasion a dichotomous process. Thirdly, Choi and Salmon (2003) criticised the model's conceptualisation of "involvement. It was argued that the concept of involvement lacked definitional clarity and precision. This has led to a wide range of definitions and varying operationalisation of the concept. It was also claimed that the model used the concept of involvement differently than other studies in that the field of persuasion which "consequently results in conflicting empirical results" (Choi and Salmon, 2003, p. 60).

See Appendix 3.4 for more information on ELM.

4.3.2 The Cognitive Dissonance Theory (CDT)

The theory of cognitive dissonance was first introduced by Leon Festinger in 1957. The CDT is essentially an attitudinal theory arguing that the relationship between attitude and behaviour has as its foundation in individuals' motivation to reduce a negative psychological state that results from two cognitions or cognitive elements that are not in alignment with one another (Liang, 2016). In order for dissonance to be manifested once a decision is made, three conditions must be met, namely: (1) the decision must be important and relevant to the individual, (2) the decision must be irrevocable and (3) the decision must be freely made (Soutar and Sweeney, 2003).

Festinger (1957) posited that an individual behaves in accordance with how accurate information about their environment is in relation to the individual's self and that any information received that disconfirms such expectations will induce dissonance. Dissonance, therefore, arouses when people encounter information that is inconsistent with cognitions that guide their behaviours and actions (Harmon-Jones and Harmon-Jones, 2002). An individual who is in a state of dissonance will be motivated to behave in a manner that will move the current self closer to the desired perceived self or further away from the undesired self (Carver and Scheier, 2002). In other words, there are two opposite cognitions that motivate a shift in

attitude or a change in behaviour, namely: the individual's perception of the current self; and their perception of the desired self.

Although the theory of cognitive dissonance is popular among psychologists, some of its conceptual foundations are criticised, or at least questioned, by academic theorists such as Aronson et al. (1974). For example, Festinger (1957) posited that a "counter-attitudinal behaviour leads to psychological inconsistency, thus resulting in cognitive dissonance". Although many theorists believe that a counter-attitudinal behaviour leads to cognitive dissonance, Aronson et al. (1974) argued there are two distinct pathways that explain why cognitive dissonance is encountered. Aronson et al. explained that cognitive dissonance either occurs as a result of psychological inconsistency, or due to self-preservation. Within these two pathways, there are several variables that result in an individual experiencing dissonance. These multiple variables can, both, create and/or reduce dissonance in an individual.

4.3.3 The Heuristic-Systematic Model (HSM)

The HSM was first introduced in the late 1980s by Shelly Chaiken in an attempt to explain how persuasive messages are processed by their receivers. It is considered to be one of the most influential models of persuasion in the field of cognitive psychology. It is a dual-process model. It comprises of two modes of information processing, namely: (1) the heuristic processing mode which "takes advantage of the factors embedded within or surrounding a message (called heuristic cues) such as its source, format, length and subject, to quickly make a validity assessment"; and (2) the systematic processing mode which "carefully researches the message's information content to make a validity assessment" (Luo et al., 2013; p. 29).

In the same manner as the ELM, the HSM assumes that when persuasive attempts appear inconsequential to the persuadee or are constrained by mitigating factors that do not allow the persuadee to carefully consider the attempt (e.g. time constraints), the heuristic route will be used rather than the systematic route (Chaiken, 1980).

Tam and Ho (2005; p. 196) referred to the heuristic route as a cognitive process in which "people consider a few informational cues - or even a single informational cue - and form a judgment based on these cues". This route is the default mode of information processing for almost all people, especially those who "prefer less cognitive effort and will spend much effort only when they have to" (Zhang et al., 2014; p. 80). In contrast, the systematic route is "information intensive and analytically oriented" and it requires individual decision-makers to "scrutinise various information sources for relevance and importance in the decision before using it" (Davis and Tuttle, 2013; p. 126). The systematic route has the potential to "suppress

the occurrence of heuristic processing" which conceptually entails a combative rather than a supplementary relationship between the two routes (Chaiken and Maheswaran, 1994, p. 460).

Although the HSM provides a good cognitive theory of persuasion, it fails to recognise the importance and the impact other people's behaviours have on one's ways of thinking and processing of persuasive messages. The assumption that human cognition and behaviour are influenced by the behaviour of others underlies the social psychology studies. For instance, the perception of authority may influence how one acts (Simpson et al., 2016) and the social actions of others may also influence how people manage their choices (Roditis et al., 2016). Thus, social norms and behaviours influence people's perception of their immediate surroundings and how they process the information available, which consequently influence how they approach, estimate and evaluate evidence provided in acts of persuasion. Appendix 1.1 discusses in a bit more detail how social norms influence people's decisions to adopt or reject innovations such as pro-environmental behaviours.

4.3.4 The Theory of Attribution

The theory of attribution was originally introduced by Kurt Lewin and two of his students. It emerged after combining the works of Fritz Heider and Julien Rotter which resulted in the creation of a theory that explains how individuals create causal explanations of behaviours or the outcomes of their behaviours (Petrenko et al., 2016). The theory is primarily concerned with people's perceptions of causality and their judgment of why a particular event happened. It purports that in order to understand why people behave in certain ways, researchers need to comprehend whether the locus of causality for an event is external - others caused the event; or internal to the individual - the person caused the event. Thus, the attribution theory examines how individuals justify their behaviours (Donia and Sirsly, 2016).

The attribution theory was among the first cognitive theories in the field of human behaviour explanation, dealing with the perception of causation of a behaviour and the consequences of such perceptions, and not including motivational constructs (Stockton, 2003). According to Heider (1958), people make attribution about other individuals' behaviours based on the relative contribution of motivation, ability, luck and other possible causes. The justifications of the behaviours are divided into situational attributions related to factors in the social and physical environment causing a person to behave in a given way, and dispositional causes related to the individual's characteristics such as one's intelligence and honesty levels.

See Appendix 3.5 for more information on the theory of attribution

4.3.5 The Theory of Planned Behaviour (TPB)

The TPB was first proposed in 1985 by Icek Ajzen as an extension to the original theory of reasoned action (TRA). Both, TPB and TRA take the view that human behaviour is mostly goal-oriented (Roberto et al., 2014). A goal is realised by carrying out an intention and unfolding an action plan. When a human conducts a behaviour, a plan is either explicitly or implicitly constructed. For example, people make an explicit plan before they go to a meeting, but people often drink water without conscious thought, although a plan has been implicitly constructed. Intention is an antecedent of action/behaviour.

TRA postulated that intentions are determined by two factors: attitude toward the behaviour and a subjective norm (Zarzuela and Antón, 2015). Both factors are often effective for behaviour that requires only volitional control. For example, people can easily turn off their PCs each time they leave their office; the behaviour of turning off one's computer is under volitional control of the person. However, if the behaviour is complicated, TRA may become ineffective because pure volitional control becomes insufficient. Hence, the TPB augmented the TRA with a new factor (i.e. perceived behavioural control) in order to accommodate for the behaviours that are not under volitional control (Roberto et al., 2014).

The construct of "perceived behavioural control" makes the TPB a much more robust model for predicting intentions (Norman and Hoyle, 2004) and behaviours (Cristea and Gheorghiu, 2016). In addition, perceived behavioural control can act as a proxy measure for actual behavioural control and either effect behaviour directly or as a moderator between intention and behaviour (Wan and Shen, 2015).

The attitude–intention relationship is fundamental to the TPB. Heberlein and Black (1976, 474) examined the actual purchasing behaviour of regular gasoline customers and unleaded gasoline customers, and supported the view that the more specific the attitude, the higher the correlation with behaviour. Many researchers have verified empirically the causal relationship between attitude and intention (e.g. Senger et al., 2017). From their results, it was shown that the more positive the user's attitude, the greater the user's intentions are to adopt or to continue to use the product or behaviour (e.g. recycling).

The subjective norm-intention relationship is also fundamental to TPB. Fishbein and Ajzen (1975, pp. 302) defined subjective norm as a "person's perception that other people who are important to him/her think he/she should or should not perform the behaviour in question". Subjective norm and behavioural intention interact positively. That is, when the individual perceives a higher social expectation for certain behaviour, he/she is more willing to take

advice from referential resources, and tends to comply with a stronger subjective norm over that behaviour, thus presenting a greater intention to perform that behaviour.

Numerous researchers have empirically verified the relationship between subjective norm and behavioural intention. For example, a study by Hunt and Gross (2009) investigated individuals' intentions to exercise and found that both attitudes towards the behaviour and subjective norms had stronger associations with the intention to exercise and the self-reported behaviour than previous studies. Another study by de Leeuw et al. (2015) used the TPB to identify the behavioural factors that underlie school students' pro-environmental behaviours and found a strong relationship between students' perceived behavioural control and their intentions to engage in eco-friendly behaviours. The subjective norms were also found to have a direct effect on students' eco-friendly beliefs. A more recent study by Halder et al. (2016) has also demonstrated the predictive strength of the TPB. It investigated students' intentions to use bioenergy in a cross-cultural context. The study confirmed the existence of a direct relationship between attitude, perceived behavioural control and subjective norm on one side, and intention on the other side. It also praised the theory's ability to explain a person's intention to actualise a particular behaviour.

Various extended versions of TPB have also been empirically tested. For example, Yadav and Pathak (2016) incorporated new constructs (i.e. environmental concern and knowledge) onto the original TPB model in an attempt to enhance its predictive strength in relation to people's green purchase intentions. Their results strongly supported the incorporation of the additional constructs onto the TPB. In fact, the new constructs did not only improve the predictive power of the original model but also emerged as more influential predictors of green purchase intentions than the original constructs.

The TPB model has been utilised as a platform for many of the more comprehensive models of behaviour, and is a general theory of social behaviour based on social-psychological modelling. It is significant because it differs from previous models by attempting to account for the effects that other people's behaviours can have on an individual. It considers the impact of normative social influences on individual behaviour (i.e. subjective or social norms). The underlying assumption of TPB is that people act according to the beliefs and values that they attach to likely outcomes. These beliefs and values lead to an overall attitude which ultimately has a significant influence on the people's intentions. Although consideration of social influences adds strength to the TPB model, the assumption that intention is the immediate precursor to behaviour is a key weakness of the model, as multiple studies indicate that behavioural intention does not always lead to actual behaviour because of circumstantial

limitations (e.g. Barr, 2005). In an attempt to address this issue, Ajzen (1991) incorporated 'perceived behavioural control' into his original model (i.e. the TRA). Perceived behavioural control is concerned with people's belief as to how easy or difficult it will be to perform a particular action or behaviour.

The concept of perceived behavioural control has been linked with self-efficacy theory. Bandura (1986) defined self-efficacy as people's belief that they can undertake the action required to produce a desired outcome. Multiple researchers have used the TRA and TPB as a basis for trying to understand behaviour, despite their multiple flaws. Jackson (2005) questions the TPB as even though it considers subjective norms, personal norms and perceived behaviour control, there are a multitude of external factors which may influence an individual's behaviour, such as social norms, personal experience, personality and demographics, which the model does not incorporate. It also fails to consider external non-human influences such as infrastructure and context and the role of what Jackson calls consumer lock-in (Jackson, 2005). Whilst it is easy to argue that the TRA and TPB models are too simplistic, models that attempt to map the true complexity of consumer behaviour are not useful tools for policy makers. As a result, pro-environmental models of behaviour have been adopted by policy-makers with little success, but social researchers continue to modify and develop these approaches because they are popular with policy-makers (Shove, 2010). Ultimately, the TPB model again assumes environmental values and/or intention are necessary precursors to behaviour. However, this assumption has been criticised by researchers who have formalised the problem that define these approaches: there is often a gap between intention and action (Barr, 2006).

The problem of volitional control is not as limited as it may initially seem and even the most mundane behaviours, such as watching a specific television programme, may present some problems of control (e.g. due to a power cut). As people are rarely absolutely certain to be able to carry out their intentions, every behavioural intention should be viewed more realistically as a 'behavioural goal', subject to some an element of uncertainty (Ajzen, 1985).

There are various factors that can influence volitional control over behaviour, as outlined by Ajzen (1985). Different people exercise more or less control over their own actions. Some people are highly capable of turning intentions into action; others are not so capable. Various personal characteristics and attributes appear to affect perceived ability to carry out a behaviour. Extroversion, open mindedness, idealism and optimism will all affect perceived ability. Social, verbal, mathematical and mechanical skills all influence people's abilities to convert intentions into actions. Lack of time or lack of opportunity may also thwart attempts to perform certain behaviours. For example, not seeing a film because all the tickets are sold out

(lack of opportunity) does not signal a change in intention and the behaviour may well have been attempted. A bad review of the film may change your beliefs and intentions so the behaviour will not be attempted.

As it is nearly impossible to precisely measure actual control, perceived behavioural control is measured instead in the TPB. As perceived, and not actual, behavioural control measure may add little to the accuracy of behavioural prediction if the perception of control is unrealistic. Perceived behavioural control is based on experience, second hand knowledge and some degree of self-assessment of ability. Different individuals will assess their perceived control over a particular behaviour to different levels of accuracy. The more accurate and realistic the perception, the more likely that behavioural controls will add to the accuracy of prediction.

4.4 Conclusions

There is a wide range of theories and models in the field of persuasive communication that a researcher can choose from, to study the factors that influence a person's behavioural intention to embrace sustainability. This chapter provided a brief introduction to some, but not all, of these theories. Each theory or model has its strengths and its weaknesses. However, only the theory of planned behaviour (TPB) was found to be compatible with the scope and conceptual arguments of Rogers' (1962) diffusion of innovations theory. In fact, the TPB fits very well into persuasion and decision stages of Rogers' innovation-decision process model. For example, the "persuasion stage" in Rogers' model conceptualises the factors that influence individuals' intentions to decide in favour or against a particular behaviour or a specific course of action which is the essence of the TPB. The TPB explains how individuals' behavioural intentions are affected by their attitudes towards the behaviour; the subjective norm; and their perceived behavioural control. The three variables combined shape individuals' intentions to adopt a particular behaviour (e.g. embrace sustainability). Accordingly, behaviours that are perceived favourably by the unit of adoption, that are viewed positively by society, and that are seen as easy to perform, are likely to diffuse much faster than others.

To sum up, Rogers' (1962) diffusion of innovations theory and Ajzen's (1991) theory of planned behaviour complement one another. Hence, the author was strongly convinced that a merger between the two theories would help eliminate, or at least mitigate, their theoretical weaknesses. Rogers' (1962) theory focuses on the innovation-specific factors that either accelerate or impede the rate of innovation diffusion, whereas Ajzen's (1991) theory focuses more on the individual-specific variables. Merging the two theories, therefore, helped to create a model that considered both the individual-specific and innovation-specific factors that impact or influence the diffusion rate of pro-sustainability initiatives/behaviours.

Chapter V

Development of a Conceptual Sustainability Diffusion Model

5.1 Introduction

Now that the selection of Rogers' (1962) diffusion of innovations theory and Ajzen's (1991) theory of planned behaviour has been justified and thoroughly explained, the next step is to detail the theoretical boundaries from within which the proposed sustainability diffusion model has emerged. Therefore, the purpose of this chapter is to facilitate greater understanding of the process of sustainability diffusion. It analyses the different forms of innovation and establishes a conceptual link between sustainability and organisational innovation. It also highlights the theoretical concepts that are relevant to the research's aim and to the subjects under study. More importantly, it draws on the existing theories in the fields of innovation diffusion to help understand the issues that are central to sustainability adoption.

5.2 Is Sustainability an Innovation?

Although there is considerable literature on sustainability and sustainable development, there has been little debate; or no debate at all, on whether the concept itself should be viewed as an innovation. Usually, scholars are able to establish a conceptual link between two or more constructs using only their definitions. However, this is not possible in this instance. The definitions of innovation and sustainability, which have been collated and analysed in Chapter II and Chapter III, do not explicitly point out the similarities and differences between the two constructs. The definitions of innovation tend to focus on the characteristics of the construct, while those of sustainability focus primarily on its dimensions. Consequently, it is difficult to link the two constructs on the basis of their definitions alone. A conceptual discussion is, therefore, necessary to illustrate the theoretical synergies that exist between sustainability and innovation. Six of the defining characteristics of innovation identified from the academic literature will be used as a basis for this discussion, namely: newness; significance of improvement; magnitude of change; usefulness; commercial value; and success.

Table IV-1 illustrates the most commonly used terminologies to define innovation and the frequency by which they are used.

Terminology	**Representative Studies**
New/Novel	Thompson 1965; Wong et al., 2009; Van de Ven 1986; Plessis 2007; Rogers, 2003; Damanpour 1996; Higgins 1995; Johne 1999; Zaltman et al., 1973; Damanpour 1991; Nohria and Gulati 1996; Boer and During 2001; Hivner et al., 2003; Gupta et al., 2007; Schulze and Hoegl 2008; Tatikonda and Rosenthal 2000; Danneels and Kleinschmidt 2001; Heany 1983; Avlonitis et

	al., 2001; Greve and Taylor 2000; Birkinshaw et al., 2008; Obstfeld 2005; Dougherty 1992; Howell and Higgins, 1990; Marcus 1988; Pennings and Harianto, 1992; Daft 1978; Garcia and Calantone 2002; Abrahamson 1996; McCabe 2002; Zbaracki 1998; Damanpour and Schneider 2006.
Significantly Improved	OECD 2005; Paap and Katz, 2004; Assink 2006; Leifer 2001; Ahuja and Lampert, 2001; Tornatzky and Klein 1982; Zaltman et al., 1973; Kock et al., 2011; Davenport, 1994; Greve and Taylor, 2000.
Change	Damanpour 1996; Hamel 2006; Slappendel 1996; Higgins, 1995; Paap and Katz 2004; Mohr, 1969; Mohnen and Roller, 2005; Kraft, 1990; Reichstein and Salter 2006; Hargrave and Van de Ven, 2006; Van de Ven and Poole, 1995.
Beneficial/Useful	Tornatzky and Klein 1982; Fichman and Kemerer 1997; Birkinshaw et al., 2008; Jaffe et al., 1993; Levitt, 1960; Utterback, 1971; Lin and Su 2014
Commercially Valuable	Akinboye 2000; Axtell et al., 2000; Levitt 1960; Becker and Whistler 1967; Jaffe et al., 1993; Garcia and Calantone 2002.
Success	Cumming 1998; Adner 2006; Birkinshaw et al., 2008.

Table IV - 1: Key Defining Terminologies of Innovation

5.2.1 Is Sustainability New?

Newness is a core the characteristic of innovation (Garcia and Calantone, 2002; Anand and Nilakanta, 1996). Something cannot be an innovation unless it is perceived to be new or a significant departure from the traditional and customary practices (Hamel, 2006). Rogers (2003, p. 12) defines innovation as an "idea, practice, or object that is perceived to be new by an individual". Newness is not measured by a lapse in time, but rather by the perception of the unit of adoption (Van de Ven, 1986). Many scholars believe that innovation carries a connotation of change (e.g. Damanpour, 1996; Mohnen and Roller, 2005). Therefore, newness is considered a reflection of the level of change the unit of adoption has to undergo (Coopey et al., 1998). The greater the level of change is, the higher the perception of newness.

An innovation covers a wide spectrum of activities, from a recombination of old ideas to the creation of disruptively new processes, products or services (Fernández, 2001; Lynn and Akgün, 2001). Thus, the change implications do not have to be significant in magnitude and scope in order for something to be considered an innovation. The impact of change can be as narrowly defined as changing the way things are done by a team, a department or a division. In this sense, even an "imitation" can be considered an innovation as long as it leads to some form of change and is perceived to be new by the unit of adoption (Van de Ven, 1986; p. 592). Therefore, the term innovation can be used to refer to: the introduction of new processes or new organisational forms; the successful commercialisation of new products and services; the application of new supply chain management practices; etc (Tepic et al., 2013).

Now, is sustainability an innovation from a newness perspective? The answer is "No" if newness is measured by a lapse in time. The evolution of the construct can be traced back to

the publication of the UN Brundtland Commission (UNBC) report in 1987. That's when academics began to explore what it meant to be sustainable. However, if newness is measured by the perception of the unit(s) of adoption, then the answer is "Yes". Although it has been over three decades since the publication of the UNBC's report, sustainability is still perceived as new by researchers and practitioners alike. The popularity of the construct is on the rise and is unlikely to reach its peak any time soon. In fact, sustainability is beginning to "fundamentally reshape" the business world, moving businesses towards a new era of sustainable development and economic growth (Lacy et al., 2012; p. 13). As resources become scarcer and as business leaders recognise the urgency of climate change, the novelty of the solutions sustainability provides will become much more explicit.

5.2.2 Does Sustainability Lead to Significant Improvements?

One cannot judge if something is an innovation or not on the basis of newness alone. Although this is a majority view in the literature, a few scholars (e.g. King, 1992) insist on the need for newness to involve a certain degree of risk so that early adopters of an innovation can be differentiated from imitators. For instance, Hamel (2006) described innovation as a significant departure from the traditional and customary management practices, principles and processes. Similarly, the Oslo Manual described innovation as something that is "new or significantly improved" (OECD, 2005). Both definitions explicitly stress the need for newness to be accompanied by significant improvements. This means that incremental changes do not necessarily constitute innovations unless they lead to significant improvements.

Sustainable thinking has evolved over the years from being focused on regulatory compliance, risk mitigation and brand management, to being an important philosophy through which cost is reduced, efficiency is optimised, customers are retained, revenues are maximised and from which eco-innovations are derived (Kiron et al., 2012; Esty and Winston, 2009). Therefore, from an improvement significance perspective, sustainability is not only an innovation but also a "key driver of innovation" (Nidumolu et al., 2009; p. 5).

5.2.3 Does Sustainability Lead to Change?

Arguably, sustainability is an innovation from a change-magnitude perspective. Sustainability implementation often forces a paradigm shift (Zoller and Scholz, 2004). However, the extent to which sustainability transforms companies' business models, strategies, practices or processes might differ from one company to another. The transformation can be as significant as switching from being a manufacturer of goods to being a supplier of services or as moderate as the creation of a hybrid business model whereby a company supplies both goods and

services, which is commonly known as "product-service system" (Mont, 2002; p. 238). Hence, one should not underestimate the significance of changes that can be derived from sustainability, especially the changes that are related to organisational culture.

The innovativeness of an organisation is often determined by its ability to foster a market-oriented culture (Hult et al., 2004). Such a culture is essential for organisations to be able to generate, as well as to absorb, innovations. Sustainability, as a philosophy, is in itself a culture. It is a culture that promotes win–win–win solutions for the environment, the society and the economy. However, fostering a "culture of sustainability" is far from straightforward (Magala, 2012). Organisations that wish to adopt sustainability will need to make big changes at multiple organisational levels, including changes to their missions, values, goals, corporate strategies and more importantly to the attitudes and behaviours of their workforce (Galpin et al., 2015). The organisational changes will also need to be complemented by operational practices to facilitate organisation-wide institutionalisation of the new culture (Atkinson, 2012). Consequently, companies will face huge challenges trying to convince their employees of the urgency of and the need for, a new set of values, beliefs and behaviours, while being simultaneously engaged in the implementation of the technical components of sustainability.

5.2.4 Is Sustainability Useful / Beneficial?

Usefulness is also an important defining characteristic of innovation. Wong et al. (2009) argued that an innovation is not only characterised by its newness, but also by the benefits it brings to an organisation. So, is sustainability an innovation from a usefulness perspective? The answer is "Yes". The usefulness of sustainable business practices can easily be evidenced at the organisational, operational and strategic levels. Organisationally, the evolutionary nature of sustainability facilitates the continuous acquisition of knowledge and the accumulation of other forms of intangible assets over time (Pourdehnad and Smith, 2012). The generation of new knowledge and the accumulation of intangible assets enable organisations to enhance their differentiation potential (Kock et al., 2011). Tacit knowledge, in particular, is of high strategic significance. It is more difficult to observe and more complex to imitate. Hence, it is a valuable source of sustainable competitive advantages (Kim et al., 2013; Kock et al., 2011).

Operationally, sustainability facilitates the acquisition of upstream and downstream functional capabilities (Beske, 2012). The upstream capabilities involve technological knowhow, R&D activities and other technological complementarities through which an organisation improves its operational efficiency (Helfat, 1994; Pandza et al., 2005). The downstream capabilities involve all market-related capabilities which entail various functions including; market research, sales, distribution, post-sale services, etc (Day, 1994; Montgomery and Hariharan,

1991). The upstream and downstream capabilities combined enable companies to capture and satisfy of the continually and rapidly evolving customers' needs, wants and expectations.

Strategically, innovations are commonly used as differentiators through which organisations differentiate their product or service offerings from their competitors and therefore sustain their competitive advantages (Pérez-Luño et al., 2007). Sustainability is no different. It facilitates more efficient utilisation of both, tangible resources (e.g. financial and physical assets) and intangible resources (e.g. brand image / intellectual capital) which consequently improves organisations' competitiveness and financial performance (Perrini and Vurro, 2010). In addition, the re-combination of skills and resources along with the alterations in workers' attitudes and behaviours as a result of sustainability adoption and implementation do not only help foster a creative and an innovative organisational culture, but also increase the speed by which new, eco-friendly products are introduced to markets (Szekely and Strebel, 2013).

5.2.5 Is Sustainability Commercially Valuable?

Commercialibility is the characteristic that differentiates an invention from an innovation (Cho et al., 2009). Invention is the "first occurrence of an idea" (Fagerberg, 2003, p. 3), whereas innovation involves the adoption, the implementation and the commercialisation of that idea in the form of new products or services. So, is sustainability an innovation from a commercial value perspective? The answer is "Yes".

It is worth noting that sustainability is not against capitalism, but it encourages a fairer distribution of resources and wealth. It requires companies to replace their traditional business models with new and more inclusive alternatives that are considerate of their social and environmental impacts (Lacy et al., 2012). In fact, sustainability is changing the rules of the game whereby companies' social and environmental behaviours are becoming determinants in their ability to attract investment, retain customer loyalty, strengthen brand image and sustain their competitive advantages (Trifilova et al., 2013; Lacy et al., 2012). It facilitates a full internalisation of externalities and helps firms move towards new business models that are much more responsive to stakeholders' demands and expectations (Poveda and Young, 2015).

Moreover, the positive impact of sustainability on organisations' innovativeness is an explicit demonstration of its commercial value. The commercial value of an innovation can be measured against several factors such as growth in market share (Tidd, 2001), rise in revenues (Figueroa and Conceiçâo, 2000) and increases in the number of patents (Rogers, 1983). Several scholars have found a positive relationship between sustainability and firms' financial performance (e.g. Renneboog et al., 2008; Orlitzky et al., 2003; King and Lenox, 2001; Carter

and Rogers, 2008; Clarkson et al., 2011). The findings of these scholars come as no surprise. Pollution is a form of resource waste. Therefore, any actions taken to prevent, minimise or mitigate pollution will automatically result in improved resource efficiency and increased productivity (Porter and Van der Linde, 1995). In addition, sustainability provides organisations with the tools needed to improve their relationship with a diverse range of stakeholders including customers, investors, governments and local communities (Orlitzky et al., 2003). Companies' relationship with customers and investors, in particular, is of high importance as it determines their ability to retain existing customers, attract new ones as well as secure much-needed investment to fuel their economic growth (Yu and Zhao, 2015).

5.2.6 Does Sustainability Lead to Success?

The ultimate goal of any innovation is to deliver greater value to consumers and help companies achieve success (Martins and Fernandes, 2015). According to Kleinschmidt and Cooper (1991), there is a positive relationship between innovations and organisations' commercial success. Sustainability is a practical example of this relationship. Sustainability is anticipated to trigger some of the greatest commercial opportunities over the next a few decades (Nidumolu et al., 2009; Markley and Davis, 2007). As customers' concerns about the social and environmental impact of corporations increase, demands for eco-friendly and socially responsible products and services will also increase (Dowell et al., 2000). According to a study by Lacy and Hayward, (2011, p. 349), 98 per cent of CEOs believe that sustainability will be "very important" to the success and long-term competitiveness of their businesses. They argue that companies which act proactively to accommodate their customers' emerging demands are more likely to gain competitive advantages than those which fail to recognise the strategic significance of sustainability (Szekely and Strebel, 2013). Therefore, sustainability is also an innovation from a success perspective.

See Appendix 4 for more information on the synergies between sustainability and innovation.

5.3 Sustainability as an Organisational Innovation

Sustainability can fit into different innovation classifications depending upon the context in which it is studied. This research conceptualises sustainability as an organisational innovation. Organisational innovation is defined as the implementation of new or significantly improved business practices, management techniques, workplace organisation, organisational structures, business models or corporate strategic orientations with the aim of minimising administrative costs, increasing productivity, improving business performance or having access to non-tradable assets (OECD, 2005). Organisational innovations are non-technological in nature and

are often "intended to further organisational goals" through modernisation of existing management practices, processes, structures and techniques (Birkinshaw et al., 2008, p. 829). Examples of organisational innovations include the Toyota Production System (i.e. Lean) and the Multidivisional Organisational Structure.

Organisational innovations take different shapes and forms. They range broadly from business models, management processes and organisational strategies to organisational cultures and leadership practices (Gallego et al., 2013; Le Bas et al., 2015). They do not necessarily have to be radical or disruptive. They can be incremental and emerge from within existing practices, processes or systems. In other words, organisational innovations can be new to the firm or new to the state-of-the-art or both (Van Lancker et al., 2016; Francis et al., 2003). They also vary significantly in terms of their complexity and their impact on existing practices. Some organisational innovations only affect a few, but not all parts of an organisational system, while others lead to changes in almost all the parts (Souto, 2015).

Organisational innovations are often part of a larger system of inventions and innovations (Ricciardi et al., 2016). A good example of this is the philosophy of sustainable development (SD). SD, as a construct, encompasses a variety of definitions and interpretations. It is interpreted differently in different contexts. From an organisational perspective, it may be interpreted as an innovation that seeks to foster a positive working environment - an environment that promotes equality, empowerment, engagement, involvement, etc (Spangenberg, 2016). Operationally, SD may be seen as an environmental management innovation that seeks to improve organisations' operational efficiency and mitigate the negative impact their operations have on the environment (Ivascu et al., 2015). Hence, SD is not a single innovation, but a collection of different innovations whose collective aim is to improve organisations' economic, social and environmental sustainability. Each innovation constitutes a crucial component of an ongoing program of performance improvement.

See Appendix 5 for more information on organisational innovation.

5.4 Diffusion of Sustainability

Now that the conceptual link between sustainability and organisational innovation has been clearly established, the next step is to demonstrate how Ajzen's (1991) theory of planned behaviour and Rogers' (1962) diffusion of innovations theory were used as a theoretical foundation for the proposed 'sustainability diffusion model'. This section, therefore, starts with a general introduction to Rogers' innovation-decision process model. It then discusses the

theoretical propositions of Ajzen's theory, and clearly explains the rationale behind the author's decision to merge Rogers' model with Ajzen's theory.

5.4.1 Rogers' Innovation-Decision Process Model

The innovation-decision process model (IDPM) is the core of Rogers' diffusion of innovations theory. The IDPM explains how a persuadee or a decision maker moves from an initial understanding of an innovation to seeking reinforcement that the decision is the right one (Walitzer et al., 2015). Between those two stages, the decision-makers move through other stages that include the persuasion stage, where individual decision-makers are persuaded positively or negatively toward the innovation, the decision stage, where decision-makers conclude that the innovation should be adopted (or rejected) and the implementation stage, where the innovation is put into practice. Whatever occurs in each of these stages determines the rate by which an innovation is diffused. The early stages, in particular, are believed to be of high decisional significance. For example, Walitzer et al. (2015, p. 18) argued that "individuals are unlikely to exhibit behaviours consistent with adoption if they do not first come to believe that doing so would yield substantial advantages over their current practices. Thus, understanding factors that affect the early stages of adoption has the potential to substantially improve our ability to effectively disseminate innovations".

The IDPM comprises five sequential steps, namely: (1) knowledge, (2) persuasion, (3) decision, (4) implementation and (5) confirmation. Rogers' five-step innovation-decision process has been critiqued for assuming that this process is, in fact, linear (Fitzgerald et al., 2002). However, Rogers contemplated that adopting units may jump back and forth in this process, giving it some form of dynamism. Another approach to determine this process is presented by Van de Ven et al. (1999) which is non-linear, dynamic and both unique and ambiguous to the participants of this process. Nevertheless, research so far has tended to favour Rogers' model for studying decision processes (e.g. Doyle et al., 2014). The reason why this process is important is that it represents the time dimension related to innovation adoption and rejection and is evidence that certain events that may affect the adoption decision does not happen at random, but at specific stages in this process (Nehme et al., 2016).

5.4.1.1 Knowledge Stage

The first stage addresses employees' level of uncertainty and fear of change (i.e. resistance to change) by increasing their awareness and improving their understanding of the innovation. The diffusion of an innovation such as sustainability might require a radical shift in employees' beliefs including their attitudes, behaviours and ways of thinking. This behavioural shift can be

difficult, if not impossible, to achieve if employees do not understand why they have to undergo the changes put forth by managers. Hence, effective dissemination of innovation-related knowledge is essential to boost employees' readiness for change (Chen, 2008). Appendix 1.2 discusses briefly how knowledge, as a cognitive variable, impacts on people's willingness to embrace sustainability and to actualise its values and principles.

The innovation-decision process is influenced by three types of knowledge, namely: awareness, how-to and principles. Different kinds of knowledge differ in their impact on individuals' attitudes towards an innovation and on their behavioural intentions to adopt that innovation. Obtaining awareness-knowledge may require potential adopters to have well developed social networks or higher levels of education (Bernatchez et al., 2015). How-to-knowledge will naturally require adopters to have some form of technical or functional skill (Tigabu et al., 2015), while principles-knowledge will require a deeper understanding for why the innovation works, for example, the understanding of the environment in which the innovation is used, or some form of tacit knowledge (Marzucchi and Montresor, 2017).

The initiation of the "knowledge stage" may be a result of either an active or a passive approach by potential adopters. An active approach means that the individual has a perceived need for this particular innovation and thus actively seeks information about this innovation. A passive approach means, in contrast, that the individuals have not been aware of their need for this innovation and exposure to the innovation is likely to happen by chance.

5.4.1.2 Persuasion Stage

The persuasion stage is of highest importance because it is at this stage that the decision-making unit begins to form favourable or unfavourable attitude and perception of the need for and usefulness of, the innovation. Hence, paying adequate attention to employees' attitudes at the initial stages of the diffusion process is crucial for organisations to avoid escalating resistance from passive resistance to active resistance (Lapointe and Rivard, 2005; Wagner et al., 2008). Organisations need also to acknowledge the complexities associated with the internal adoption of innovations. It is wrong to assume that employees will, by default, support the diffusion of innovation. Although prior research on social behaviour suggests that individuals have a tendency to associate themselves with activities that are perceived positively in their societies (Polletta and Jasper, 2001; Whetten and Mackey, 2002), it does not mean that employees will not question the need for and the usefulness of an innovation.

Sustainability, for example, remains a contested concept. Managers' understanding of the concept and what it entails is still limited (Frandsen et al., 2013), let alone that of employees'.

Managers, therefore, need to embrace the fact that employees may not be as enthusiastic to adopt sustainability as one would hope. It is also dangerous to devise diffusion strategies based on the ideals that employees have a positive perception of pro-sustainability innovations and thus they will automatically embrace the new policies, practices or systems with insignificant levels of resistance, dissatisfaction and distrust.

5.4.1.3 Decision Stage

It is at this stage that the decision-making unit, be it an organisation, a manager or an employee, decides to adopt or reject an innovation (Rogers, 2003). Adoption is the decision to make full use of the innovation, while rejection simply is the decision not to adopt. It is believed that individuals' willingness to adopt an innovation can be increased by improving their perceptions of, and their attitudes towards, the innovation (Van Hulst and Posthumus, 2016). Howard et al. (2017) argued that individuals' positive perceptions of the usefulness of an innovation relates positively to their intensions to adopt and use that innovation. They explained that "attitudes shape one's behavioural intention to use a technology, which would necessarily, in turn, affect actual system usage" (Howard et al. 2017: p. 109).

5.4.1.4 Implementation Stage

Organisations' or individuals' abilities to successfully adopt and operationalise an innovation (e.g. sustainability) are path-dependent not only on previous stages of the diffusion process but also on historic events that occurred in the past. There are two key elements of the path dependence theory that apply to innovation diffusion, namely: initial conditions and lock-in mechanisms (Cooper, 2015). Each stage of the diffusion process begins with 'initial conditions' and ends with 'dynamic lock-in mechanisms'. The initial conditions refer to a moment in an organisation's or an individual's relevant history at which they started to consider the adoption of the innovation (Van Driel and Dolfsma, 2009), while lock-in is defined as "a process that systematically excludes competing technologies, views and practices and as such creates internal resistance towards sustainability transitions" (Kuokkanen et al., 2017: p. 935). This means that each stage of the sustainability diffusion is path-dependent on the actions taken, decisions made and events that occur between the initial conditions and lock-in in the stage that precedes it. Thus, initial conditions and lock-in mechanisms play an important part in creating an environment that is conducive to new innovations. According to Cooper (2015: p. 3), "path dependence, potentially leading to lock-in, can occur whenever a technology is such that positive feedback mechanisms ensure that its greater use brings ever greater returns".

5.4.1.5 Confirmation Stage

At the confirmation stage, the individual, group or organisation institutionalises and locks-in the new routines and behaviours. Wagner et al., (2011) stated that in the 'lock-in' process, organisations attempt to sustain an equilibrium and 'lock out' competing ideas. However, the term 'lock-in' does not necessarily mean total absence of change. In fact, without dynamic lock-in mechanisms, organisations will not be able to continually adopt and implement new innovations. Sustainability, in particular, is dynamic in nature and requires lock-in mechanisms that ensure continuous innovation exploration, adoption and operationalisation.

Although being in a state of "locked-in" is necessary at the final stage of sustainability diffusion to ensure that the sustainability innovations become an everyday routine, organisations can become locked-in in a situation that is no longer favourable. For example, organisations that utilise ISO14001 as the basis for their sustainability efforts might find themselves locked-in to a situation where their ability to produce innovations or their capacity to adopt new innovations is hindered by the excessive standardisation of the ISO14001 system.

5.4.2 The Theory of Planned Behaviour

The theory of planned behaviour or TPB was first introduced by Icek Ajzen in 1991 as an improved version of the theory of reasoned action or TRA (Ajzen and Fishbein, 1980). Goh et al. (2017: p. 124) referred to TPB as a "rational decision-making model that uses three key independent variables to predict behavioural intentions"; namely, (1) people's attitudes; (2) subjective norm; and (3) perceived behavioural control. TPB has been widely used in the study of behaviour, including health behaviour, education behaviour, management behaviour, medical behaviour, technology behaviour, recreation, and sports behaviour, etc. These studies support the TPB model and confirm that TPB is better than TRA in predicting human behaviour. For example, Harrison et al (1997) used TPB to explain and predict decisions by small businesses to adopt IT. The participating respondents were senior executives from 162 small businesses, all of whom were responsible for making IT-adoption decisions. The results supported the importance of attitude, subjective norm, and perceived control to IT adoption.

The inclusion of perceived behavioural control in the original TRA model has been shown to improve behavioural prediction, although the importance of each of the attitude, subjective norm and perceived behavioural control constructs on intention and behaviour may vary according to the behaviour in question, as well as the situation (Ajzen, 1991). For some behaviours, such as exercising regularly, personal attitudes may be a stronger influence on behaviour than perceptions of control or the extent to which others would agree or disagree

with the behaviour. For other behaviours, such as attendance for preventive screening, wearing a cycle safety helmet, or cycling instead of driving - what Lee et al. (2016) call behaviours with the potential to affect others as well as self - normative influences may be a stronger predictor of behaviour.

5.4.2.1 Intention and Behaviour

Behaviour is defined as anything a person does (Paul et al., 2016). Armitage and Conner (2004, p. 128) defined behavioural intention as "people's decisions to perform particular behaviours and represent a summary of people's motivation to act". It is usually regarded as a cognitive component of consumer attitude, and it is an indication of the effort someone plans to exert in performing that behaviour and the most immediate indicator to predict one's behaviour (Sheeran, 2002). TRA and TPB conceptualise the relationship between behavioural intention and the actual behaviour differently. TRA assumes that most things that people do are under volitional control in that people can carry them out if they want to. For example, people can go shopping, watch a film, or attend a training session if they want to. TRA is designed to predict behaviours of this kind. As the name implies, the 'theory of reasoned action' assumes that people behave in a rational manner and think about the likely outcomes and consequences of what they do before they do it. It assumes that the immediate antecedent of any behaviour is the intention to perform the behaviour. People are expected to do what they intend to do, to behave in accordance with their intentions. Intentions capture the motivational forces that influence behaviour; the stronger the intention, the more likely the performance of the behaviour. The motivational forces behind behavioural intention are assumed to be attitude towards a behaviour and subjective Norm.

In contrast, the TPB specifies the determinants of attitudes, norms, and perceptions of control, and uses behavioural intention to predict behaviour (Senger et al., 2017). It argues that whilst a perfect relationship is not expected between behavioural intention and behaviour, a person will usually act in accordance with his or her intention. TPB added a third form of belief to TRA (i.e. control belief). In addition to TRA's two forms of belief: attitudinal belief and subjective norms, control belief is used by TPB to explain human behaviour when facing incomplete volitional control. TRA claims that the higher the intention to perform behaviour, the better likelihood that actual behaviour will be performed. However, this conclusion is only valid under volitional control (Ajzen, 1985). In a specific context, such as time, availability of resource, money and cooperation of others, the behaviour achievement cannot be executed properly only when having the higher behavioural intention. When the person can control these factors, the inference from intention to behaviour performance will be successful.

Besides, Gollwitzer and Brandstätter (1997) suggest that when intention is made, and an opportunity relevant to the intention is encountered, an individual mentally links the opportunity to the goal intention, thus "promoting immediate action initiation" (p. 195). They argue that the effect is due to two mechanisms: first, a cognitive representation of the situational stimuli is formed, which becomes immediately activated upon encountering the stimuli itself, and second, intentions create links similar to those that would otherwise only be achieved through consistent and repeated acting in these situations, making action-initiation automatic or habitual. Intentions thus work like habits, but the cues and the behaviour are paired as the result of cognitive, rather than behavioural rehearsal.

See Appendix 1.2 for more information on behavioural intention and how behavioural control, as a cognitive variable, impacts on people's actual behaviours.

5.4.2.2 Perceived Behavioural Control and Intention

Livi et al. (2017: p. 26) defined perceived behavioural control (PBC) as a "person's perception of control in executing a behaviour". PBC acts as a proxy measure for actual control as well as the confidence an individual has in their ability to perform a specific behaviour (Paul et al., 2016). It does not only influence individuals' intentions, but also moderates their attitudes towards the behaviour. Castanier et al. (2013: p. 149) argued that "people who assess the behaviour positively are more or less inclined to enact behaviour to the extent that they respectively have strong or weak perceptions of behavioural control, which suggests that PBC will moderate the effect of attitudes on behaviour".

People's PBC is influenced by their control beliefs. Armitage and Christian (2003; p. 191) defined control beliefs as the "perceived frequency of facilitating or inhibiting factors multiplied by the power of those factors to inhibit/facilitate the behaviour in question". Where a behaviour is under volitional control, failure to perform a behaviour indicates a change in intention. Where a behaviour is not under volitional control, the behaviour may not be carried out either due to a change in intention or because attempts to carry out the behaviour failed. Volitional control affects behaviours like giving up smoking; however it also affects behaviours perceived as more mundane and under a persons' control. For example, going shopping to the supermarket may not be possible due to your car breaking down on the way there or not having enough money to go shopping. Factors beyond one's control may prevent performance. Some behaviours are more subject to problems of control than others.

5.4.2.3 Attitude and Intention

Attitude is conceptualised as a "favourable or unfavourable evaluation of behaviour" (Menozzi et al., 2017). The more positive attitude a person has toward a behaviour (i.e. the more favourable the outcomes associated with performing the behaviour), the more likely they are to carry out the behaviour in question. However, it is important to note that some behaviours will be relatively more influenced by attitudinal considerations, some more by normative ones; often both factors will have an influence. The relative influence or weighting of normative and attitudinal factors varies from behaviour to behaviour, and from person to person. Many studies have found greater attitudinal than normative weighting and this has lead some researchers to question the value of the subjective norm component (Yeo et al., 2017).

Attitude is determined by someone's beliefs associated with an object and an evaluation of that belief (Fishbein, 1979). Alternatively, subjective norm is someone's beliefs regarding the perceived expectation from his/her reference group and the motivation to comply with those beliefs and reference groups (Fishbein, 1979). Within TPB, attitudes refer to affective or valence responses toward behaviour rather than the generalised attitude object (Hale et al., 2002). Thus, the intention to perform a specific behaviour toward the subject or actual behaviour regarding the subject is associated with his/her attitude.

5.4.2.4 Subjective Norm and Intention

Azjen (1991: p. 188) defined subjective norm as the "perceived social pressure to perform or not to perform the behaviour". In a society, individuals may be influenced by people who are important to them. Such influences also impact whether they would or would not perform a particular behaviour. These people may include family members, line managers, or colleagues. They could also be suppliers, peers, or customers (normative influence). Normative influence is deemed to be an antecedent of subjective norm.

Peers, superiors, and subordinates in a business situation could hold different perspectives and views. If individuals from these groups play important roles in the mind of the user, they would then probably influence the user's thoughts on certain behaviours. As for an organisation considering the adoption of sustainability, the behavioural intention of an individual member of the corporate teams could be affected by both that individual's personal attitude and by the external reference group (e.g. customers) in frequent contact with that individual. These reference groups could also be significant factors in their decisions regarding the adoption of sustainability or pro-sustainability behaviours. Members in the reference group will press their own values, moral norms, or perceived information on the individual in the corporate teams, and affect that individual's values, moral norms, or perceived information.

Many studies show that certain reference groups have significant influence on the behavioural intention, and that these different reference groups provide a wide variety of influences. Taylor and Todd (1995) pointed out that the two major sources of reference groups are peer influence and superior influence. Taylor and Todd (1995) also mentioned another two main reference groups, internal and external normative belief influences. It was reported that various influences of subjective norms from different groups might countervail with each other because of the interaction among these influences. For example, a colleague might find that some newly installed software would cause enormous changes to the original task-processing flow, and therefore vote against the new application, whereas the manager might support the application for a possible enhancement of efficiency. In this case, the impact from subjective norm on intention to adopt would become insignificant and have no effect.

5.4.3 A Conceptual Merger: Rogers' IDPM and Ajzen's TPB

One of the key contributions this research study made to knowledge is the conceptual merger between Rogers' diffusion of innovations theory and Ajzen's theory of planned behaviour to create a 'sustainability diffusion model' that takes into account the complexity and path dependency nature of sustainability diffusion. Although Rogers' (1983) innovation-decision process model helps to understand some of the innovation-specific factors/characteristics that can either accelerate or impede the rate of sustainability diffusion, it does not pay sufficient attention to the person-specific factors. To overcome this limitation, the author decided to incorporate Ajzen's TPB into Rogers' Model in order to capture the full picture and to study the person-specific and innovation-specific factors simultaneously. Ajzen's (1991) theory helps to predict a person's intention to engage in a particular behaviour at a specific time and place. According to the theory, a person's intention to engage in a sustainable behaviour can be predicted by three factors: attitude, subjective norm and perceived behavioural control.

Incorporating Ajzen's TPB into Rogers' innovation-decision process model helped to create a holistic sustainability diffusion model that took into consideration several behavioural factors that influence individuals' attitudes towards the adoption and implementation of sustainability initiatives. Besides, 8 additional variables were incorporated into the new model to boost its predictive power, and to strengthen its theoretical foundation, namely: perceived source credibility; perceived argument quality; perceived self-interest; perceived consequences; perceived urgency of change; perceived persuader legitimacy; perceived risk; and communicability (*See* Figure V - 1). Each of these variables is believed to influence the outcome of innovation decision processes.

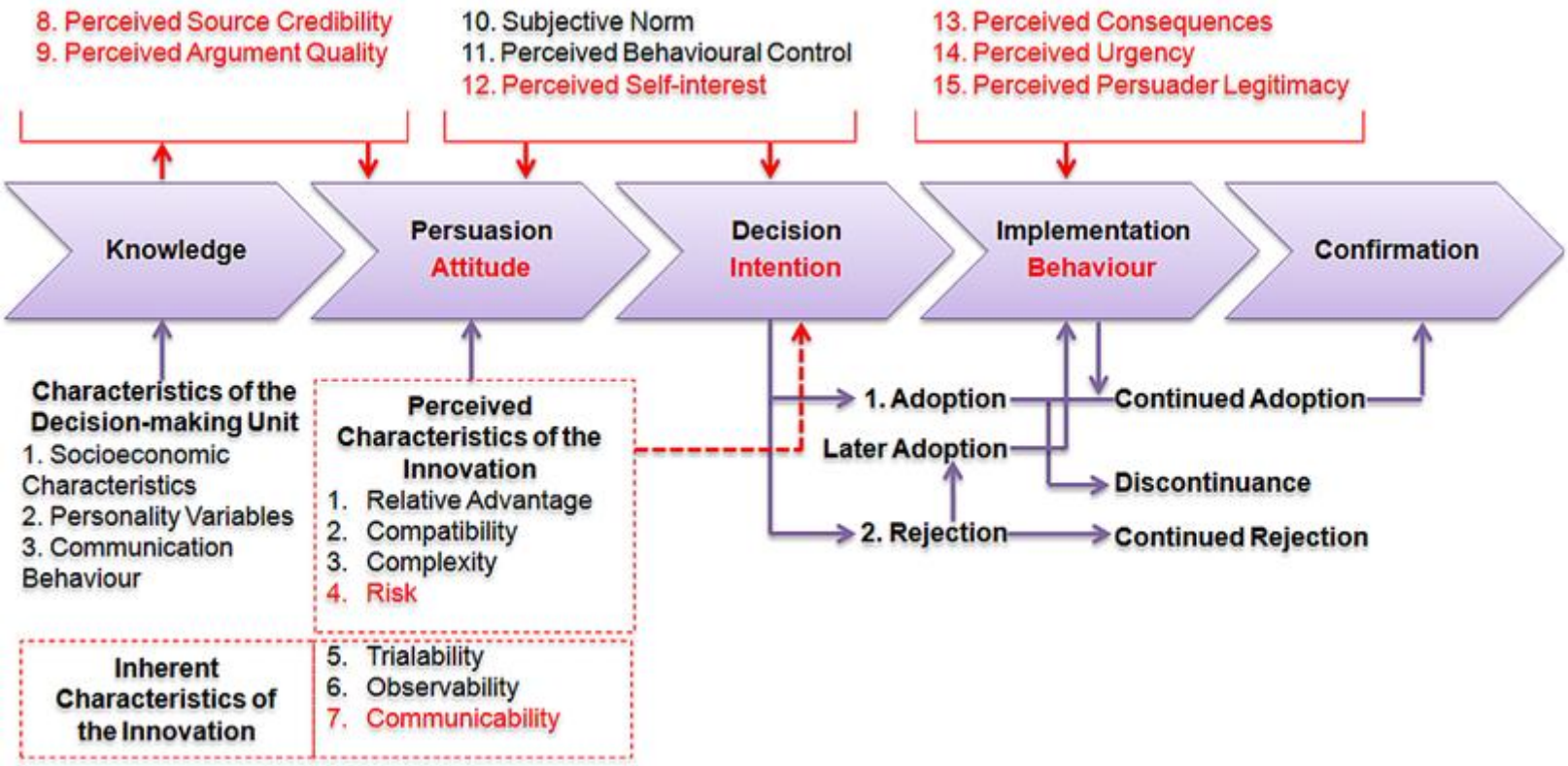


Figure V - 1: The Initial Sustainability Diffusion Model

Note: Figure V - 1 shows the initial draft of the proposed sustainability diffusion model before it was modified in accordance with feedback/comments received from the experts who took part in the verification study.

5.5 The Research Hypotheses

This section presents the theoretical arguments that were used to advocate and justify the inclusion of each variable of the 15 variables in the proposed 'sustainability diffusion model'.

5.5.1 Perceived Relative Advantage

Perceived relative advantage refers to the "ratio of expected benefits and the costs of adoption of an innovation" (Rogers, 2003: p. 233). The relative advantage construct is considered to be one of the strongest predictors of innovations' rates of adoption (Haggman, 2009). This construct reflects the degree to which a particular innovation is perceived to be more advantageous than its precedent (Henard and Szymanski, 2001; Wejnert, 2002). The construct comprises both economic and non-economic advantages. Examples of economic advantages include the cost savings and the operational efficiency improvements that can be realised from the innovation (Flight et al., 2011). Examples of non-economic advantages include enhanced social status and improved customer satisfaction (Zhu and Kraemer, 2002; Schneider, 2007). If the decision-making units (i.e. employees) perceive these advantages to be of a greater value than what is offered by the existing system/practice, they are likely to have positive attitudes towards the innovation, which in turn increases the rate of its diffusion. Early adopters are often motivated by the innovation's social status advantage (Sahin, 2006).

However, not all innovations have explicit relative advantages. In fact, the advantages of some innovations can be very uncertain. Rogers (2003) divided innovations into two categories; namely, preventive innovations and incremental innovations. A preventive innovation is defined as a "new idea that an individual adopts now in order to lower the probability of some unwanted future event" (Rogers, 2003: p. 233). This type of innovation has a slower rate of adoption, as its relative advantage is highly uncertain. In contrast, incremental innovations are characterised by a higher outcome certainty and are, therefore, adopted at a higher rate (Sahin, 2006). That is why it is commonly recommended that organisations should utilise artificial mechanisms such as financial payment incentives to increase the perceived benefits of preventative innovations which will, in turn, have a positive impact on employees' attitudes towards these types of innovations.

It was, therefore, hypothesised that:

H1a: perceived relative advantage is positively related to employees' attitudes towards sustainability / new sustainability initiatives.

H1b: perceived relative advantage is positively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H1c: perceived relative advantage is positively related to the diffusion rate of sustainability / new sustainability initiatives.

5.5.2 Perceived Compatibility

Compatibility refers to the "degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters" (Rogers, 2003: p. 15). Sustainability compatibility refers to how well the philosophy/ideology fits into employees' personal values and social structures. If sustainability is perceived by employees as consistent with their existing values, principles, needs, past experiences and work routines, these positive perceptions are likely to increase the rate of its adoption (Venkatraman, 1991; Cestre and Darmon, 1998; Aggarwal et al., 1998).

The compatibility of sustainability can be divided into three sub-dimensions; namely, personal, social and structural. Firstly, the personal dimension deals with individuals' existing values, habits and lifestyle (Flight et al., 2011). An innovation that is compatible with a person's routines and values diffuses at a faster rate than an innovation that requires the individual to break a habit and abandon the existing routines (Rogers, 2003). Secondly, the social dimension deals with the compatibility of an innovation with a person's social expectations (Atuahene-Gime, 1995). An innovation that is socially unacceptable diffuses at a slower rate than an innovation that is congruent with the social norms. Last but not least, the structural dimension deals with an innovation's alignment with existing processes and structures (Flight et al 2011). An innovation that requires minimal changes to existing systems and structures diffuses at a faster rate than an innovation that requires a radical reconstruction of existing processes and structures (Chatterjee et al., 2002). Moreover, compatibility is a perceived issue. The compatibility of sustainability or any other innovation is largely dependent upon the subjective judgment of the decision-making unit (Vavakova, 1995; Al-Ali, 1995).

It was, therefore, hypothesised that:

H2a: perceived compatibility is positively related to employees' attitudes towards sustainability / new sustainability initiatives.

H2b: perceived compatibility is positively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H2c: perceived compatibility is positively related to the diffusion rate of sustainability / new sustainability initiatives.

5.5.3 Perceived Complexity

Complexity refers to "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003: p. 15). Complexity is considered an obstacle to an innovation's adoption. The greater the perceived complexity of an innovation is, the slower the rates of its diffusion and adoption. Innovation complexity has multiple facets. Complexity can refer to the intellectual difficulty of a particular innovation, which makes it difficult to be understood by the unit of adoption (Gopalakrishnan and Damanpour, 1994). It can also refer to the degree of originality of a particular innovation. Very original innovations are more difficult to trial, experiment with, and implement (Damanpour and Schneider, 2008). They are also associated with a higher level of uncertainty and a lower likelihood of success (Gopalakrishnan and Damanpour, 1994). This association sometimes leads to subjective interpretation of risk (Dowling and Staelin, 1994), which in turn results in a reduced willingness to adopt new innovations (Sia et al., 2004; Verhoef and Langerak, 2001).

Sustainability may be perceived as difficult at both the organisational and operational levels. Organisationally, sustainability requires making changes in organisational structures, processes and in inter-firm and intra-firm interactions. Operationally, sustainability might require the replacement of existing infrastructures, which can be costly and might require a lot of resources and skills to implement. Either way, the perceived complexity is a key barrier to sustainability adoption.

It was, therefore, hypothesised that:

H3a: perceived complexity is negatively related to employees' attitudes towards sustainability / new sustainability initiatives.

H3b: perceived complexity is negatively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H3c: perceived complexity is negatively related to the diffusion rate of sustainability / new sustainability initiatives.

5.5.4 Perceived Risk

Perceived risk refers to the probability or likelihood of an innovation's failure to meet the needs and expectations of the unit of adoption (Flight et al., 2011). Rijsdijk and Hultink (2003) described riskiness as a multidimensional concept that can be divided into six different

dimensions; namely, psychological risk, physical risk, social risk, financial risk, performance risk and risk of time loss. Hansen (2006) conceptualised risk as an individual's perception of the possibility of generating negative results or suffering from the negative consequences of an innovation adoption failure. Thus, an innovation that has a high likelihood or probability of failure will diffuse at a much slower rate than an innovation with a lower probability of failure.

The diffusion process of an innovation such as sustainability is often characterised by a high level of uncertainty and unpredictability. A failure to adopt sustainability can be rather costly, not only financially, but also psychologically. Adoption failure of sustainability can have an adverse psychological impact on the innovative behaviours of organisations and individuals. The perceived risk of failure is negatively associated with individuals' adoption attitudes (Teo and Pok, 2003). Adoption failures increase individuals' reluctance to make decisions in favour of adopting risky innovations, even if they are explicitly advantageous (Kahneman and Tversky, 1979). Thus, the perceived risk of failure or the perception of any negative outcome is likely to retard the rate of innovation diffusion (Ostlund, 1974; Holak and Lehmann, 1990).

It was, therefore, hypothesised that:

H4a: perceived risk is negatively related to employees' attitudes towards sustainability / new sustainability initiatives.

H4b: perceived risk is negatively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H4c: perceived risk is negatively related to the diffusion rate of sustainability / new sustainability initiatives.

5.5.5 Trialability

Trialability refers to the "degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003: p. 16). The trialability of innovations has a positive impact on their rate of adoption. Triability is highly important, especially in the case of radical innovations. It helps to reduce any uncertainties or any complexities that may be associated with the innovation which will, in turn, result in a favourable attitude towards its adoption (Flight et al., 2011). Triability also allows the units of adoption to consider how the innovation can be modified or changed to meet their specific needs (Flight et al., 2011). This is referred to as "reinvention".

Reinvention is defined as the "the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation" (Rogers, 2003: p. 130). The

reinvention of an innovation during its diffusion speeds up the rate of its adoption. The implementation of sustainability is characterised by a high probability of reinvention. An organisation might approach sustainability adoption by combining the principles of Green Management and Lean Management to form a Green Lean system, while another might combine Total Quality Management with Environmental Management to form a Total Quality Environmental Management system.

It was, therefore, hypothesised that:

H5a: trialability is positively related to employees' attitudes towards sustainability / new sustainability initiatives.

H5b: trialability is positively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H5c: trialability is positively related to the diffusion rate of sustainability / new sustainability initiatives.

5.5.6 Observability

Observability refers to the "the degree to which the results of an innovation are visible to others" (Rogers, 2003: p. 16). An innovation has to generate observable positive results in order to trigger an individual's intentions to adopt it. In this sense, the observability of an innovation acts as a motivational trigger, which encourages individuals to adopt a particular innovation. It also helps to initiate a domino effect, which facilitates the diffusion of the innovation to the 'early majority' of adopters. However, one must understand that getting innovations adopted can be rather difficult, even when they have obvious advantages (Rogers, 2003). Thus, an innovation's observability acts as a motivator, rather than a facilitator of adoption. Observability helps to speed up the rate of adoption by showcasing the benefits and usefulness of a particular innovation to potential adopters (Holak, 1988; Tornatzky and Klein, 1982). It has the greatest impact on the attitudes of 'late adopters', who tend to take much longer time observing a particular innovation before making a decision on whether to adopt it or reject it (Hsu et al., 2007). Observability also helps to increase adopters' confidence in their ability to make the innovation work for them which will, in turn, lead to its continued adoption (Flight et al., 2011; Kapoor et al., 2014).

It was, therefore, hypothesised that:

H6a: observability is positively related to employees' attitudes towards sustainability / new sustainability initiatives.

H6b: observability is positively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H6c: observability is positively related to the diffusion rate of sustainability / new sustainability initiatives.

H6d: observability is positively related to later adoption of sustainability / new sustainability initiatives.

5.5.7 Communicability

Communicability refers to the degree to which an innovation can be mass-communicated to potential adopters (Flight et al., 2011). The communicability of an innovation facilitates mass-adoption, as information about the characteristics of the innovation (i.e. compatibility and relative advantage) is easily communicated, shared and transferred amongst potential adopters (Tornatzky and Klein, 1982). Communicability is positively associated with the relative advantages and compatibility of innovations (Holak and Lehmann, 1990). The more communicable an innovation is; the greater access potential adopters have to information regarding its features, benefits and relative advantages. Arguably, sustainability has a high degree of communicability. The benefits of the philosophy can be easily described and explained to others. This means that sustainability has a mass-adoption potential.

It was, therefore, hypothesised that:

H7a: communicability is positively related to employees' attitudes towards sustainability / new sustainability initiatives.

H7b: communicability is positively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H7c: communicability is positively related to the diffusion rate of sustainability / new sustainability initiatives.

5.5.8 Perceived Source Credibility

Beaulieu (2001: p. 85) defined source credibility as the quality that determines "whether sources of information inspire belief in their representations". Source credibility was also defined as the perception of the message receiver that the source of the message is expert and trustworthy (Tormala et al., 2006). Sources that are perceived to be competent and unbiased are taken much more seriously and are listened to far more attentively than those that lack credibility. Hence, source credibility is one of the very few factors that is taken very seriously,

and which is always considered when making adopt/reject decisions. Highly credible sources produce more persuasive messages and are more likely to induce a favourable attitude towards the adoption of an innovation (Khong and Wu, 2013). In contrast, sources with "low credibility either have their messages discounted in various ways or cause decision makers to expend more effort in coming to a decision" (Schwarzkopf, 2006: p. 20).

In the context of sustainability diffusion, perceived source credibility does not necessarily have a direct impact on individuals' attitudes towards sustainability innovations or their intentions to adopt or reject a particular sustainability initiative. Instead, it moderates the relationship between knowledge and attitude. If the source of sustainability-related knowledge is perceived to be credible, that knowledge is more likely to have a positive impact on potential adopters' attitudes towards sustainability in general, and towards its adoption in particular.

It was, therefore, hypothesised that:

H8a: perceived source credibility positively moderates the relationship between sustainability-related knowledge and employees' attitudes towards sustainability / sustainability initiatives.

H8b: perceived source credibility positively moderates the relationship between sustainability-related knowledge and the diffusion rate of sustainability / new sustainability initiatives.

5.5.9 Perceived Argument Quality

Bhattacherjee and Sanford (2006; p. 811) defined argument quality as "the persuasive strength of arguments embedded in an informational message". A high quality pro-sustainability argument is more likely to produce a change in attitude toward sustainability and a behaviour change than poor quality messages. Ajzen and Fishbein (1980; pp. 221) argue that it is the information that is the key to the persuasion process - a change in content of a message could give a very different effect on perceived argument quality and source credibility. The intention of any persuasive communication or message is to produce a desired result - that people change their actions as a result of seeing or hearing it. The persuasiveness of the message or communication will depend on several factors such as how the message is communicated and marketed, and whether it is targeted appropriately at the intended audience. However, the content of the message and the quality of its core arguments determine whether the message will have the desired effect on the receivers' attitudes or not.

As is the case with perceived source credibility, perceived argument quality moderates the relationship between knowledge and attitude. If the pro-sustainability argument is perceived to

be of high quality, sustainability-related knowledge is more likely to have a positive impact on potential adopters' attitudes to sustainability in general, and towards its adoption in particular.

It was, therefore, hypothesised that:

H9a: perceived argument quality positively moderates the relationship between sustainability-related knowledge and employees' attitudes towards sustainability / sustainability initiatives.

H9b: perceived argument quality positively moderates the relationship between sustainability-related knowledge and the diffusion rate of sustainability / new sustainability initiatives.

5.5.10 Subjective Norm

Subjective norm refers to "one's perceptions or assumptions about others' expectations of certain behaviours that one will or will not perform" (Huda et al., 2012: p. 272). It is a function of one's beliefs that are formed by others in one's life (Fishbein and Ajzen, 1975). According to the theory of planned behaviour (Ajzen, 1991), people's attitudes towards a behaviour and their intentions to perform that behaviour, are influenced by their perception of social pressure, be it in favour or against that behaviour. Subjective norm is, therefore, based on normative beliefs; the person's assessment of whether individuals or groups important to them think they should or should not perform the behaviour in question (Halder et al., 2016). It is weighted by a measure of how much the person wants to comply with the important individuals or referents. If a person believes that the referents are likely to think he/she should carry out a behaviour, and he/she is motivated to comply with them, he/she is likely to perform the behaviour in question (Goh et al., 2017). The normative belief element is, like the belief strength element of attitude, a measure of subjective probability; in this case, a subjective assessment of the probability that important referents think a behaviour should be performed. The motivation to comply element is an evaluative measure of the utility gained from complying with the referents.

More recent studies (e.g. Manning, 2009) suggest that subjective norm should include two types: injunctive norm (IN) and descriptive norm (ON). IN is defined as perceived pressure from peer groups of performing behaviour, whereas ON is a mimicking behaviour of his/her peer group. These two types of norm do not violate the definition proposed by Fishbein and Ajzen (1991) within the TPB.

It was, therefore, hypothesised that:

H10a: a pro-sustainability subjective norm is positively related to employees' attitudes towards sustainability / new sustainability initiatives.

H10b: a pro-sustainability subjective norm is positively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H10c: a pro-sustainability subjective norm is positively related to the diffusion rate of sustainability / new sustainability initiatives.

H10d: pro-sustainability subjective norm has a positive, indirect effect on sustainability actualisation (through behavioural intention).

H10e: pro-sustainability subjective norm has a positive, indirect influence on an employee's willingness to decide in favour of sustainability adoption (through behavioural intention).

5.5.11 Perceived Behavioural Control

Perceived behavioural control refers to individuals' beliefs concerning their skills and abilities to perform a particular behaviour (Ajzen, 1991). Perceived behavioural control encompasses individuals' assessment of their own skills and resources to carry out an action or behaviour and also their assessment of the likely environmental facilitators and inhibitors relating to the behaviour (Cristea and Gheorghiu, 2016). Ajzen (1985) claimed that "when the perceived control is realistic, it is successful in predicting intention and behaviour". Sheeran et al. (2002) argued that "the relationship between perceived behavioural control and behavioural intention not only depends on the type of behaviour, but on the individual involved". This means that people's characteristics, especially in terms of abilities and confidence, do have an effect on their willingness to embrace a particular behaviour or adopt a particular innovation. However, one must note that perceived behavioural control is based on experience, second-hand knowledge, and some degree of self-assessment of ability. Accordingly, different individuals will assess their perceived control over a behaviour to different levels of accuracy. The more accurate and realistic the perception, the more likely that behavioural controls will add to the accuracy of behavioural prediction.

It was, therefore, hypothesised that:

H11a: perceived behavioural control is positively related to employees' attitudes towards sustainability / new sustainability initiatives.

H11b: perceived behavioural control is positively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H11c: perceived behavioural control is positively related to the diffusion rate of sustainability / new sustainability initiatives.

H11d: perceived behavioural control has a positive, indirect effect on sustainability actualisation (through behavioural intention).

H11e: perceived behavioural control has a positive, indirect influence on an employee's willingness to decide in favour of sustainability adoption (through behavioural intention).

5.5.12 Perceived Self-Interest

Sears and Funk (1990) defined self-interest as a "short-to-medium term impact of an issue (e.g. a decision to adopt sustainability) on the material well-being of the individual's personal life". The definition, however, excludes several other possibilities, especially non-material interests such as, social status, spiritual contentment, social adjustment, self-esteem, or feelings of moral righteousness. The assumption is that if sustainability is perceived to have a positive impact on the material or non-material well-being of an individual's personal life, that individual is likely to have a favourable attitude towards it and is more likely to display greater willingness to adopt it.

Moreover, when people decide whether to adopt or reject a particular innovation, they often engage in a loss/gain analysis in order to maximise the probability of gain and minimise the possibility of loss (Miaoa and Weib, 2013). Such analysis is intended to guard and/or improve one's self-interest (Lindenberg and Steg, 2007). Miaoa and Weib (2013: p. 104) argued that individuals "tend to demonstrate environmentally friendly behaviour, as long as they perceive sufficient benefits such as monetary savings". This means that people are likely to embrace pro-sustainability initiatives if they perceive the initiatives to guard/boost their self-interest and/or increase their personal gain (Bamberg et al., 2003).

It was, therefore, hypothesised that:

H12a: a favourable perception of self-interest is positively related to employees' attitudes towards sustainability / new sustainability initiatives.

H12b: a favourable perception of self-interest is positively related to employees' intentions to adopt sustainability / new sustainability initiatives.

H12c: a favourable perception of self-interest is positively related to the diffusion rate of sustainability / new sustainability initiatives.

H12d: a favourable perception of self-interest has a positive, indirect effect on sustainability actualisation (through behavioural intention).

H12e: a favourable perception of self-interest has a positive, indirect influence on an employee's willingness to decide in favour of sustainability adoption (through behavioural intention).

5.5.13 Perceived Consequences

Consequence, as a term, is defined as a result or effect that is unwelcome or unpleasant (Moscovitch et al., 2012). Perceived consequences have a salient influence on behaviour (Colon et al., 2005). Influencing individuals' beliefs about the consequences of performing a particular behaviour produces changes in their attitude toward that behaviour (Ajzen and Fishbein, 1975). This means that if unsustainable behaviours are explicitly associated with negative consequences, such as hindered promotion chances, individuals are likely to have more favourable attitudes towards behaving sustainably.

People generally fit into one of two groups in terms of their perceptions of consequence; namely, present-oriented and future-oriented (Strathman et al., 1994). Dassen et al. (2015: p. 13) explained that "present-oriented individuals tend to focus on the immediate consequences of their behaviour, whereas future-oriented individuals give more importance to the future consequences, even if there are immediate costs". To put this into context, present-oriented individuals need to experience the consequence of their unsustainable behaviour in order for them to take sustainability seriously, whereas future-oriented individuals do not need to see the consequences of climate change, social injustice and economic inequality in order to realise or be convinced that sustainability/sustainable development is the right way forward.

It was, therefore, hypothesised that:

H13a: perceived consequences are positively related to the diffusion rate of sustainability / new sustainability initiatives.

H13b: perceived consequences are positively related to the actualisation of sustainability / new sustainability initiatives.

H13c: perceived consequences have a positive influence on an employee's willingness to decide in favour of sustainability adoption.

H13d: perceived consequences are positively related to continued adoption of sustainability / new sustainability initiatives.

5.5.14 Perceived Urgency of Change

Urgency means "of pressing importance" (Kotter, 2013: p. 7). Kotter (2008) argues that "when people have a true sense of urgency, they think that action on critical issues is needed now, not eventually, not when it fits easily into a schedule". Communicating the need for, and urgency of change is crucial to ensure employees' acceptance of, and readiness for change (Smith, 2005). Diffusion urgency helps to generate social pressure within an organisation, which in turn increases employees' willingness to engage in a particular behaviour (e.g. sustainability adoption). One must understand that getting innovations adopted can be rather difficult, even when they have obvious advantages (Rogers, 2003). Hence, organisations sometimes have to deliberately create an emotional stir-up in order to increase employees' dissatisfaction with the status quo. This helps to "break open the shell of complacency and self righteousness" in the organisation (Lewin, 1951: p. 229). Without doing this, employees will neither understand the need for change nor recognise the discrepancy between the current state and the desired state (Armenakis and Harris, 2002). However, the recognition of discrepancy alone does necessarily create a sense of urgency. Employees actually have to recognise that there is a "clear and present danger, a tangible and immediate problem that must be confronted if the organisation is to remain economically viable" (Beer et al., 1990: p. 55).

The importance of diffusion urgency cannot be overemphasised. The creation of a sense of urgency is considered to have a significant impact on the success of change efforts (Kotter, 1995). Many change initiatives fail due to the fact that employees do not really recognise the need for, or urgency of change (Abdolvand et al., 2008). Thus, without a sufficient level of dissatisfaction with the status quo, the diffusion efforts of sustainability will be destined for failure. To reduce the probability of failure, organisations will need to have an 'intentional destabilisation strategy' in order to break the status quo and increase employees' willingness to decide in favour of sustainability adoption.

It was, therefore, hypothesised that:

H14a: perceived urgency is positively related to the diffusion rate of sustainability / new sustainability initiatives.

H14b: perceived urgency is positively related to the actualisation of sustainability / new sustainability initiatives.

H14c: perceived urgency has a positive influence on an employee's willingness to decide in favour of sustainability adoption.

H14d: perceived urgency is positively related to continued adoption of sustainability / new sustainability initiatives.

5.5.15 Perceived Persuader Legitimacy

Legitimacy is "the power which stems from internalised values which dictate that [an individual or an organisation] has a legitimate right to influence a person and that the person has an obligation to accept this influence" (French and Raven, 1959: p. 159). Persuaders with higher levels of perceived legitimacy induce more opinion agreement than persuaders with lower levels of perceived legitimacy (Tyler, 1997). In other words, individuals are more likely to be persuaded of the need for sustainability by a person whom they perceive to have the legitimacy to persuade them than a person with a lower level of legitimacy.

It was, therefore, hypothesised that:

H15a: perceived persuader legitimacy is positively related to the diffusion rate of sustainability / new sustainability initiatives.

H15b: perceived persuader legitimacy is positively related to the actualisation of sustainability / new sustainability initiatives.

H15c: perceived persuader legitimacy has a positive influence on an employee's willingness to decide in favour of sustainability adoption.

H15d: perceived persuader legitimacy is positively related to continued adoption of sustainability / new sustainability initiatives.

5.5.16 Knowledge

The first step in the sustainability diffusion process is concerned with the transfer of knowledge between the persuaders and the persuadees. Making knowledge available is different from knowledge transfer. Knowledge transfer occurs when the recipients of knowledge change their attitudes and behaviours as a result of utilising the received knowledge (Argote and Ingram, 2000). Brachos et al. (2007: p. 32) conceptualised knowledge transfer as a "sequenced collective action and change, involving alteration and transformation in cognition and action both of the sender and the receiver". This conceptualisation suggests that the effectiveness of knowledge transfer is measured by the extent of changes in individuals' attitudes, behaviours and mental models.

The transfer of sustainability knowledge amongst employees is inversely related to perceived risk and complexity of sustainability adoption. This means that increased flow of information

and greater sharing of sustainability knowledge help to dispel any adoption misconceptions and eliminate any fears over potential adoption risks or complications. Overcoming adoption misconceptions, in turn, helps to create an environment where individuals are inclined to have favourable attitudes towards sustainability adoption.

The process of knowledge transfer comprises individuals' abilities, attitudes and actions of knowledge dissemination and utilisation (Yi, 2009; Lin, 2007). Knowledge resides in individuals. Thus, knowledge transfer is critically dependent on organisations' abilities to influence individuals and increase their willingness to share their knowledge with others (Becerra-Fernandez and Sabherwal, 2010). The willingness of individuals to share sustainability-related knowledge with others is a reflection of their attitudes towards sustainability, which is influenced by their personal characteristics. These include socioeconomic characteristics, communication behaviour and personality traits (Rogers, 2003). Hence, organisations need to understand how these characteristics influence the knowledge sharing behaviours of employees in order to be able to increase their willingness to participate in knowledge transfer activities.

In terms of communication behaviour, individuals can be divided into two categories; namely, opinion leaders and opinion seekers (Shoham and Ruvio, 2008). Both parties influence the direction of information flow and the effectiveness of knowledge transfer. The concept of opinion leaders and opinion seekers is crucial to the understanding of how individuals' knowledge transfer behaviour is influenced by others. Rogers (2003: p. 300) referred to opinion leadership as "the degree to which an individual is able informally to influence other individuals' attitudes or overt behaviour in a desired way with relative frequency". Opinion leaders are often the early adopters of innovations (e.g. sustainability), while opinion seekers are likely to be late adopters (Turnbull and Meenaghan, 1980).

Opinion leaders are characterised by greater levels of knowledge and involvement, which is a reflection of their innovative behaviours (Lyons and Henderson, 2005). They share their knowledge with opinion seekers via an interconnected communication networks through which sustainability-related information flows. The extent and the level of information sharing are dependent on whether individuals perceive themselves to be opinion leaders or opinion seekers. Individuals' perceptions of their opinion leadership influence their information sharing behaviours and their knowledge transfer intentions (Sun et al., 2006).

In terms of socioeconomic characteristics, the levels of information sharing and knowledge transfer are at its highest amongst individuals who have similar characteristics in terms of

social status, education, beliefs and preferences (Boyd and Ellison, 2007; Steffes and Burgee, 2009). Rogers (2003: p. 19) referred to this type of similarity between individuals as "homophily". Homophily is defined as the extent to which two or more individuals, who interact with each other, are similar in certain attributes such as social status, attitudes and demographics (Rogers, 2003). Homophily is considered to have a significant impact on the transfer of sustainability-related knowledge between individuals. In an organisation, employees are more likely to interact with others who have similar characteristics, especially in terms of attitudes towards sustainability. Employees who are pro-sustainability are likely to interact with others who support sustainability adoption. This behaviour helps to breed informal connections amongst employees, which in turn helps to increase the levels of knowledge sharing and knowledge transfer within the organisation.

It was, therefore, hypothesised that:

H16a: knowledge is positively related to employees' attitudes towards sustainability / new sustainability initiatives.

H16b: the relationship between knowledge and employees' attitudes towards sustainability / new sustainability initiatives is moderated by perceived argument quality.

H16c: the relationship between knowledge and employees' attitudes towards sustainability / new sustainability initiatives is moderated by perceived source credibility.

H16d: knowledge has a positive, indirect influence on employees' intentions to adopt sustainability / new sustainability initiatives.

H16e: knowledge is positively related to the diffusion rate of sustainability / new sustainability initiatives.

5.5.17 Attitude (Persuasion)

Attitudes are explained by Černoušková (1988: p. 5) as "mental dispositions expressing evaluative relationship; which means that they are lasting systems of positive or negative evaluations, feelings and tendencies of acting towards people, objects of the external world as well as towards ourselves". People's attitudes usually arise during the process of satisfying their needs. Positive attitudes are linked to the desired objects of the need, as well as to the devices that help people to satisfy certain needs. Gardner (1985: p. 51) explained that attitudes are, together with desire, the most important determinants of motivational intensity, which refers to the "degree of effort the individual expends to achieve a goal". Certainly, if an individual displays a positive attitude towards a particular behaviour, they are more likely to

embrace it. Černoušková (1988: p. 7) suggested that "the norms of behaviour, values and beliefs of the social group we are members of are the most common determinants in the process of generating our attitudes".

Attitude is used in academic research as a major construct for human behaviour explanation. In fact, attitude is considered a "fundamental concept in both social and behavioural sciences" (Ajzen, 2001). While previous research implied that one can hold one and only one attitude at a time, some studies refute this assumption. Wilson et al. (2000) proposed, for instance, a model of dual attitudes, suggesting that when an attitude changes, the new attitude overrides, but may not replace the old one. Accordingly, one may, in a similar situation, have concurrently two or more different attitudes toward a given object or issue. Individuals may also hold multiple context-dependent attitudes toward a same object or issue (Ajzen, 2001).

In the context of sustainability diffusion, it is at the persuasion stage that the decision-making unit (e.g. an employee) begins to form a favourable or unfavourable attitude and perception of the need for and usefulness of, sustainability. Organisations, therefore, need to acknowledge the complexities associated with the internal adoption of sustainability. It is wrong to assume that employees will, by default, support sustainability diffusion. Workers are likely to question the need for sustainability. Hence, paying sufficient attention to employees' attitudes at the initial stages of the diffusion process is crucial in order to avoid escalating resistant reactions from passive resistance to active resistance (Wagner et al., 2008). Sustainability initiatives are adopted, implemented and operationalised by people, therefore, unless employees have positive attitudes towards the new initiatives, they are unlikely to work or meet expectations. The more positive attitudes people have towards a particular behaviour (i.e. embrace sustainable computing), the more favourable the outcomes associated with performing the behaviour, the more likely they are to carry out the behaviour in question (Goh et al., 2017).

However, it is important to note that some behaviours are relatively more influenced by attitudinal considerations, while others by normative ones; often, both factors will have an influence. The relative influence or weighting of normative and attitudinal factors varies from behaviour to behaviour, and from person to person. Many studies have found greater attitudinal than normative weighting, and this has led some scholars to question the value of the subjective norm component (e.g. Norman et al., 2005).

It was, therefore, hypothesised that:

H17a: attitude is positively related to employees' behavioural intentions to embrace sustainability / new sustainability initiatives.

H17b: attitude mediates the relationship between knowledge and employees' behavioural intentions to embrace sustainability / new sustainability initiatives.

H17c: attitude mediates the relationship between perceived relative advantage and employees' behavioural intentions to embrace sustainability / new sustainability initiatives.

H17d: attitude mediates the relationship between perceived compatibility and employees' behavioural intentions to embrace sustainability / new sustainability initiatives.

H17e: attitude mediates the relationship between perceived complexity and employees' behavioural intentions to embrace sustainability / new sustainability initiatives.

H17f: attitude mediates the relationship between perceived risk and employees' behavioural intentions to embrace sustainability / new sustainability initiatives.

H17g: attitude mediates the relationship between observability and employees' behavioural intentions to embrace sustainability / new sustainability initiatives.

H17h: attitude mediates the relationship between communicability and employees' behavioural intentions to embrace sustainability / new sustainability initiatives.

H17i: attitude mediates the relationship between trialability and employees' behavioural intentions to embrace sustainability / new sustainability initiatives.

H17j: attitude mediates the relationship between observability and later adoption/continued rejection of sustainability / new sustainability initiatives

5.5.18 Behavioural Intention (Pre-Decision)

Ajzen (1991) argued that the "immediate antecedent of any behaviour is the intention to perform the behaviour". People are expected to do what they intend to do, to behave in accordance with their intentions. Intentions capture the motivational forces that influence behaviour; the stronger the intention, the more likely the performance of the behaviour (Yadav and Pathak, 2016). The motivational forces behind behavioural intention are assumed to be attitude towards the behaviour; perceived behavioural control; and subjective norm (Ajzen, 1991). The first factor is concerned with whether an individual has a favourable or an unfavourable attitude towards the behaviour in question. The second predictor is concerned with an individual's perceived behavioural control, which refers to an individual's perceived ability to adopt and operationalise the new sustainability initiative. The more confident an individual feels about their ability/competence to operate an innovation, the higher their

intentions to adopt it. The third antecedent of intention is concerned with the perceived social pressure to engage or not to engage in a particular behaviour.

In order for people to make a decision in favour of sustainability adoption, they have to be psychologically ready to cope with the consequences of such a decision. The consequences include the need to change their routines, behaviours or everyday habits. Armenakis and Fredenberger (1997: p. 144) defined readiness as "a mindset that exists among employees during the implementation of organisational changes". Readiness is also defined as the "cognitive precursor to the behaviour of either resistance to, or support for, a change effort" (Armenakis et al., 1993: p. 682). The change readiness construct comprises two dimensions; namely, a psychological dimension and a structural dimension.

Firstly, the psychological dimension deals with individuals' attitudes towards change by communicating the benefits of change, the reasons for change and the need for change (Holt et al., 2007). The psychological readiness for change is considered to have a significant influence on the success of change initiatives (Oakland and Tanner, 2007; Holt et al., 2009; Armenakis et al., 2007). Thus, it needs to be addressed at the very early stages of the diffusion process, especially at the persuasion and pre-decision stages. Secondly, the structural dimension refers to the "the circumstances under which the change is occurring and the extent to which these circumstances enhance or inhibit the implementation of change" (Holt et al., 2009: p. 51). This dimension has a greater impact on individuals' perceived behavioural control. It relates to individuals' skills, knowledge and abilities and therefore, has a significant impact on their perceived self-efficacy. The structural dimension of readiness emphasises the need for organisations to create an organisational structure, climate and culture that natures individuals' willingness and abilities to change (Luo et al., 2006).

The subjective norm construct is also a major predictor of individuals' behaviours (Ajzen, 1991). An individual's decision to adopt an innovation is influenced by the social context in which it is adopted (Katz and Shapiro, 1986). In an organisation, the subjective norm indicates to an employee whether a particular behaviour is considered desirable by the organisation, superiors, co-workers or even customers (Igbaria et al., 1996). It demonstrates importance of an innovation in their particular social contexts. Thus, generally, innovations that are perceived to be socially desirable diffuse at a faster rate than those which are socially undesirable.

It was, therefore, hypothesised that:

H18a: behavioural intention is positively related to an employee's willingness to decide in favour of sustainability / new sustainability initiatives adoption.

H18b: behavioural intention is positively related to the actualisation of sustainable behaviours / new sustainability initiatives.

H18c: behavioural intention mediates the relationship between subjective norm and the actualisation of sustainable behaviours / new sustainability initiatives.

H18d: behavioural intention mediates the relationship between perceived behavioural control and the actualisation of sustainable behaviours / new sustainability initiatives.

H18e: behavioural intention mediates the relationship between perceived self-interest and the actualisation of sustainable behaviours / new sustainability initiatives.

H18f: behavioural intention mediates the relationship between subjective norm and employees' decisions with regards to the adoption/rejection of sustainability / new sustainability initiatives

H18g: behavioural intention mediates the relationship between perceived behavioural control and employees' decisions with regards to the adoption/rejection of sustainability / new sustainability initiatives

H18h: behavioural intention mediates the relationship between perceived self-interest and employees' decisions with regards to the adoption/rejection of sustainability / new sustainability initiatives

H18i: behavioural intention mediates the relationship between observability and later adoption / continued rejection of sustainability / new sustainability initiatives

5.5.19 Adoption/Rejection (Decision)

At the decision stage, an individual decides whether to adopt or reject a particular innovation (Rogers, 2003). The individual has to weigh the relative advantage, compatibility, complexity and the risks associated with an innovation and make a decision accordingly. It is at this stage that the decision-making unit, be it a manager or an employee, decides whether to adopt or reject sustainability. Although this stage is very important for understanding sustainability diffusion and adoption, it is very difficult to study. This is because adoption decisions occur silently and invisibly. It is, therefore, very difficult to capture the exact moment of the decision. This study is not interested in the timing of a decision but is rather interested in the outcome of that decision. It is interested in the factors that encourage employees to make decisions in favour of sustainability adoption. Refer to Appendix 1.4 for examples of external factors which are believed to foster an environment that is conducive to sustainability.

5.5.20 Behaviour (Actualisation)

Turning sustainability ideas into actions requires organisations to successfully drive through complex organisational challenges. The path dependence theory could be used to explain how complex organisational dynamics influence organisations' abilities to diffuse innovations. The theory is widely used to understand the phenomenon of intended change in firms and to decipher how organisations' abilities to manage and adapt to new changes influence their survivability and performance (Allen, 2001). It suggests that each stage of the diffusion process is path-dependent on what occurs in its precedents. In other words, the outcome of the actualisation stage is dependent on the information individuals receive and on the opinions and attitudes that they form in the first three stages of the diffusion process (Yu and Tao, 2009). Hence, organisations that pay sufficient attention to the initial stages of the diffusion process often succeed in the actualisation of new innovations (Carayannis and Turner, 2006).

Organisations are complex systems that continually identify, exploit and adapt to new market opportunities, whilst their environments continue to change (Nielsen and Lassen, 2012). They respond and adapt to changes in their competitive environments in different ways (Burnes, 2004; Burnes, 2005). Organisations' choices of response to changes in their environments are not always predictable (Allen, 2001); therefore, they should be viewed in the context of an evolutionary process whereby strategic choices and decisions are influenced by different internal and external factors. It is common for decisions to be plagued by uncertainty and unpredictability and have to be made in a manner that is mindful of the past and considerate of the future (Guth and Stadler, 2007; Bergh et al., 2011). This approach to decision-making corresponds to path dependency.

The theory of path dependence suggests that the implementation process of new innovations (e.g. sustainability) is firm-specific and is path dependent (Coombs and Hull, 1998). The theory assumes that the direction of an organisation is shaped by a number of insignificant, small events that occurred in the past, which often lead to significant consequences in the future (Driel and Dolfsma, 2009). For example, an organisation that neglected the need for an effective environmental management system (e.g. ISO14001) is likely to find it very difficult to successfully adopt, implement, operationalise and reap the benefits of sustainability. In other words, an organisation's dynamic capabilities may be constrained by the decisions and events, small or large, which were made or occurred in the past.

In the context of sustainability diffusion, organisations' abilities to perform each stage of the diffusion process will be constrained by the actions, events and decisions made in the preceding stages. For example, if an organisation fails to adequately disseminate

sustainability-related knowledge and provide sufficient information to its employees, that organisation is unlikely to succeed in persuading or securing employees' 'buy-in' in relation to the adoption and implementation of new sustainability initiatives.

There are two key elements of path dependence theory that can be conceptualised and linked to sustainability implementation, namely initial conditions and lock-in mechanisms. The initial conditions refer to a moment in an organisation's relevant history at which it started to consider the diffusion of an innovation (e.g. sustainability). The initial condition of an organisation might include existing management practices, routines, culture and strategic resources. These conditions play an important part in creating an organisational environment that is conducive to new innovations.

The implementation of sustainability often involves the modification, elimination or replacement of old routines, be it organisational or operational, with new, higher order routines. Higher order routines refer to organisational practices that provide guidance and direction for the selection of new routines (Driel and Dolfsma, 2009). The existence of higher order routines in a firm's initial conditions increases its capacity to diffuse new innovations. In other words, organisations that already have higher order routines or a culture that promotes innovative behaviours and continuous search for excellence prior to the implementation of sustainability are more likely to avoid some of the organisational implications of sustainability diffusion (e.g. resistance to change) than their counterparts with a culture that promotes standardisation and institutionalisation of routines.

Moreover, keeping a diffusion momentum is important to ensure successful lock-in of new sustainability initiatives. The implementation of sustainability, like other organisational innovations, might take a long time. This study does not conceptualise 'time' singularly as a clock time or social time of calendars, but rather as a multi-dimensional function that affects socio-environmental life on a multitude of levels (Adam, 2000). The dimensions of time include time frames, temporality and tempo. Time frames refer to the traditional forms of time such as clock and calendar time, where hours, weeks, months and years combined constitute the frames within which particular activities are undertaken. Temporality refers to the time in things, processes and events such as time of change, evolution, renewal and regeneration. Tempo refers to the speed and intensity of actions that occur during processes of transformation and change.

Adam (2000) brought together the different dimensions of time under the banner of 'timescape'. Timescape does not view time as an abstract concept of clock-time, but rather as a

historical time with mechanistic characteristics and path-dependencies. The concept of timescape discourages organisations from viewing uncertainties as a threat. Instead, it encourages them to view uncertainties as a natural occurrence that needs to be taken into consideration. It also helps to avoid misleading and inadequate 'certainties' that can lead to a range of surprising consequences.

This study conceptualises the impact of timescape on the success of sustainability diffusion under the banner of 'diffusion momentum'. However, measuring whether an innovation diffusion process is a success or a failure can be very difficult (Armbruster et al., 2008), especially when considering the temporality and tempo nature of diffusion processes (i.e. radical vs. incremental diffusion). All stages of a radical innovation have to be achieved in order for it to be considered a success, while every stage of an incremental innovation is considered a success in itself. Incremental innovations are more often successful than their radical counterparts (Wagner et al., 2011). This is perhaps because incremental innovations generate a continual momentum of incremental changes that keep individuals engaged for longer 'time frames' than their radical counterparts. In contrast, radical innovations are disruptive in nature, often lead to significant changes to a firm's existing structures and processes, and are characterised by a considerable level of risk (Garcia and Calantone, 2002). This study does not argue for or against radical innovations. Instead, it puts an emphasis the importance of a maintaining a diffusion momentum (i.e. incremental, continuous adoption).

It was, therefore, hypothesised that:

H19a: behaviour mediates the relationship between perceived persuader legitimacy and continued adoption of sustainability / new sustainability initiatives.

H19b: behaviour mediates the relationship between perceived urgency and continued adoption of sustainability / new sustainability initiatives.

H19c: behaviour mediates the relationship between perceived consequences and continued adoption of sustainability / new sustainability initiatives.

5.5.21 Confirmation

The second element of the path dependence theory is the lock-in mechanisms. Lock-in refers to the institutionalisation of new practices, routines and behaviours. However, the term 'lock-in' does not necessarily mean total absence of change. Sustainability is dynamic in nature and requires lock-in mechanisms that ensure continuity of innovations. It is widely used to refer to the state that occurs after a change has taken place, where actors engage in the reproduction of a certain path (Arthur, 1989). Wagner et al. (2011) stated that in the 'lock-in' process,

organisations attempt to sustain an equilibrium and 'lock out' competing ideas. The state of locked-in can create either negative or positive situations. For example, a locked-in state is necessary at the final stage of sustainability diffusion to ensure that sustainability practices become an everyday routine within the organisation. On the other hand, an organisation can become locked-in to a situation that is no longer favourable.

5.5.22 Socio-economic Characteristics

This study also explored the extent to which people's socio-economic characteristics influence their behaviours. The socio-economic characteristics studied were: age; work experience; level of education; gender; and job position.

It was hypothesised that:

H20: An employee's age (i.e. older employees are more inclined towards sustainability than younger employees) is positively related to:

- Attitude
- Behavioural Intention
- Adoption Decision
- Behaviour
- Continued Adoption
- Later Adoption

H21: An employee's work experience (i.e. more experienced employees are more inclined towards sustainability) is positively related to:

- Attitude
- Behavioural Intention
- Adoption Decision
- Behaviour
- Continued Adoption
- Later Adoption

H22: An employee's level of education (i.e. highly educated employees are more inclined towards sustainability) is positively related to:

- Attitude
- Behavioural Intention
- Adoption Decision
- Behaviour
- Continued Adoption
- Later Adoption

H23: An employee's gender (i.e. women are more inclined towards sustainability than men) is positively related to:

- Attitude
- Behavioural Intention
- Adoption Decision
- Behaviour
- Continued Adoption
- Later Adoption

H24: An employee's job position (i.e. the higher their position, the more inclined toward sustainability employees are) is positively related to:

- Attitude
- Behavioural Intention
- Adoption Decision
- Behaviour
- Continued Adoption
- Later Adoption

5.5.23 Innovative Behaviour

There are clear differences in the rates at which different people adopt new innovations; this is sometimes referred to as innovativeness (Reinhardt and Gurtner, 2015). It is related to human behaviour, decision-making, and a whole host of other variables such as resources, organisational context, and the characteristics of particular innovations. Rogers (2003) developed a set of categories to help standardise and simplify future research. Rogers' (2003) adopter categories included: "innovators; early adopters; early majority; late majority; and laggards". These categories are discussed in detail in Section 6.4.

It was hypothesised that:

H25a: employees' innovativeness is positively related to their attitudes towards the adoption of sustainability / new sustainability initiatives.

H25b: employees' innovativeness is positively related to their behavioural intentions to adopt sustainability / new sustainability initiatives.

H25c: employees' innovativeness is positively related to their willingness to decide in favour of the adoption of sustainability / new sustainability initiatives.

H25d: employees' innovativeness is positively related to the actualisation of sustainability / new sustainability initiatives.

H25e: employees' innovativeness is positively related to the diffusion rate of sustainability / new sustainability initiatives.

5.6 Conclusions

This study set out to develop a greater understanding of sustainability diffusion. The author borrowed theories and concepts from the innovation diffusion literature and behaviour management literature and applied them to sustainability in order to develop a multi-disciplinary diffusion model. Ajzen's (1991) theory of planned behaviour and Rogers' (2003) innovation-decision process model were used as a theoretical foundation to identify 16 different factors that do, directly or indirectly, influence the rate of sustainability diffusion. These factors were then combined in a single model to form a "sustainability diffusion model".

The originality of the proposed model does not stem from the mere identification of the determinants of sustainability adoption, but rather from the multi-disciplinary analysis of the subjects at hand, which draws its arguments from both the theoretical and empirical literature. It goes beyond the analysis of individuals' and organisations' motives for sustainability implementation towards an improved understanding of how workers' attitudes and perceptions of sustainability can influence the rate of sustainability diffusion.

Chapter VI

Research Methodology

6.1 Introduction

This chapter presents the methodological approach which was used to achieve the study's aim and objectives. It outlines the research's philosophy, design and the methods used to collect, analyse and interpret the primary data. It also provides an overview of how the research hypotheses were tested; how the measurements used in each study were operationalised, and what methodological issues were taken into consideration when designing and conducting the empirical investigations.

6.2 Research Design

Research design involves "the process of focussing your perspective for the purposes of a particular study" (Babbie, 2010: p. 117). Researchers must understand the nature of their research problems before undertaking their research. This understanding can help to determine the way the research should be designed to produce reliable, robust and useful results. It has been suggested that research is "the exploration through experience of relations between our interpretations of the past and the ongoing nature of things" (Greer, 1969: p. 160). Cohen et al. (2007: p. 78) argued that there is "no single blueprint for planning research design – each problem is unique and research design should be governed by the notion of fitness for purpose". Simply put, the best research model for a particular issue is "the one that most accurately answers the questions" being asked (Salkind, 2011: p. 8). Salkind noted that a good research design should prevent the researcher from following pre-conceived assumptions.

Planning and carefully considering the research design does have its benefits. Some of the key benefits include the fact that the overall research becomes an integrated project with a start and an end point; that there is an opportunity to conceptualise the research idea, define the research problem and describe the theoretical and methodological frameworks; and that it provides an opportunity for peer review and assessment (Kelly, 2004: p. 142). The reverse also applies. Aguinis and Henle (2002: p. 36) argued that "poorly designed research will lead to inaccurate conclusions, which may hurt the populations to which it is applied".

It is important that the research design matches "the requirements of the research questions posed" (Blaikie, 2010: p. 39). The nature of the "research questions to be addressed will have an important effect on the research methods chosen" (Hall, 2008: p. 76). The nature of the

research design, therefore, should be one that "matches possible strengths and weaknesses with the needs of the research question; one that will enable the type of knowledge required to be provided at a particular time in history" (Heppner et al., 2008: p. 78).

This study used a mixed research design. It combined exploratory and conclusive research designs (*See* Figure VI-1). The first part of the study (i.e. the Delphi investigation) employed an exploratory approach to research, whereas the second part (i.e. the hypotheses testing investigations) utilised a conclusive research design. Exploratory research design is commonly used in situations where there are a few or no earlier studies that can be used to anticipate the results or outcomes of a particular research investigation (Saunders, 2016). It is best suited for studies that aim to: develop a better understanding of particular subject or problem; generate new ideas and assumptions; test hypotheses or develop tentative theories; set the scene for a more thorough and systematic investigation of the research problem; and establish new priorities for future research (Saunders, 2016).

A sub-category of conclusive research design is causal design. Causality research studies are undertaken by social scientists to provide a better understanding of a particular social phenomenon (Saunders, 2016). These studies also produce causal explanations that reflect tests of hypotheses. They often focus on the measurement of causal effects and how a change in an independent variable leads to a change in a particular dependent variable. Hence, it was intuitive to utilise a causal research design for the second part of the research. It enabled the researcher to test the research hypotheses and highlight the nature of the relationship that exists between the dependent and independent variables under investigation.

Broadly, this study's research methodology was divided into two parts. The first part sought to empirically verify the conceptual and theoretical propositions put forth by the author and the structural architecture of the proposed 'sustainability diffusion model'. The second part sought to empirically test the research hypotheses and validate the architecture of the proposed model in three different contexts; namely, duplex printing; sustainable computing; and sustainability culture. The first part involved the use of a Delphi method and a panel of experts, whereas the second part involved the use of a web-based quantitative questionnaire and employees.

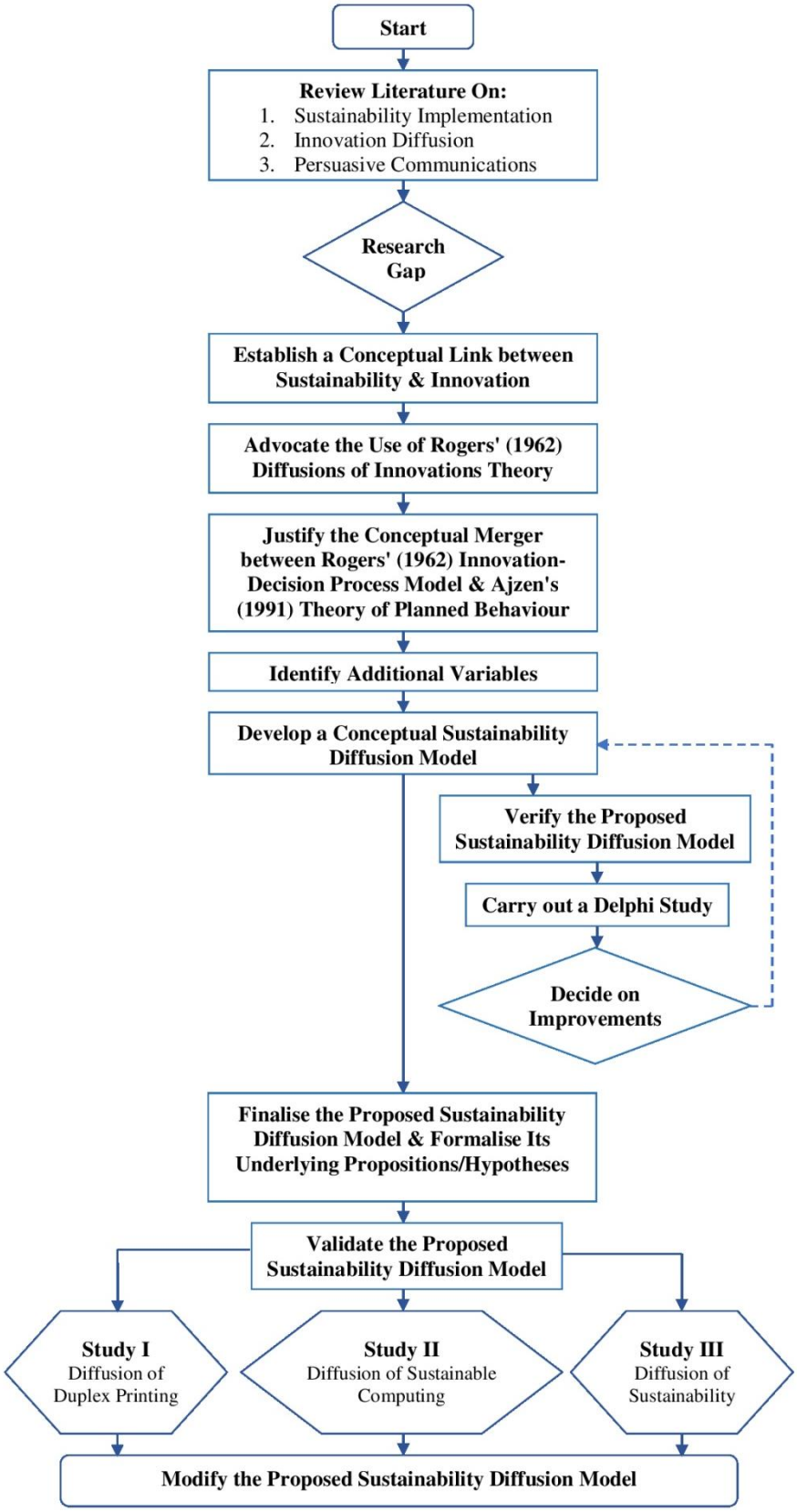


Figure VI - 1: Flowchart of Research Design

6.3 Model Verification - The Delphi Method

6.3.1 Purpose of Delphi

In order to verify the practicality and the theoretical foundation of the proposed diffusion model (*See* Figure V-1), it was necessary to seek the opinions of academics and practitioners who were well-known for their contributions, knowledge and expertise in sustainable management in general, and in sustainable innovation in particular. The Delphi method provided a reliable means of collecting, analysing and interpreting data from a panel of experts. Dalkey and Hemler (1963: p. 458) explained that the Delphi method helps researchers to "obtain the most reliable consensus of opinion of a group of experts by a series of intensive questionnaires interspersed with controlled opinion feedback". This is why the Delphi technique is commonly used for exploratory research in emerging research areas.

The decision to use the Delphi method for this research was based on three important considerations; namely, the nature of the problem under investigation; the need for expert opinion; and the practical feasibility of the method itself. First, the Delphi method is commonly used by researchers and practitioners who seek to find practical solutions to "complex problems" (Linstone and Turoff, 1975). This study sought expert opinions on several complex issues in relation to the diffusion, adoption and implementation of sustainability. For example, the study asked; is sustainability an innovation? If it is, what type of innovation is it? Does it diffuse in a pattern similar to that of other innovations such as 'organisational innovations'? If it does, is it justifiable to use Rogers' diffusion of innovations theory to explore the factors that affect the rate by which it is diffused? Can Rogers' theory be used in conjunction with other theories such as Ajzen's theory of planned behaviour?

Second, this study proposed a new 'sustainability diffusion model'. This model needed to be verified prior to validating/testing its underlying assumptions/hypotheses. No one was better positioned to validate the model than academics and practitioners who had first-hand experiences, knowledge, and expertise in the field of sustainable management. One could ask: why did you use Delphi and not a group discussion? The answer is simple. The general expectation was that people would have different views on the subjects under investigation based on their first-hand experiences with sustainable management. Delphi offered anonymity. The participants were free to express their opinion without having to be under the influence of groupthink or the pressure of the bandwagon effect. The bandwagon effect means that when the majority of a group believes in something, others tend to conform to this belief. With Delphi, there is no way in which the answers of the experts can influence each other. Delphi

overcomes the problems of interacting groups. Hence, no other group communication processes (e.g. focus-group methodology) can elicit the same data from a panel of experts.

Third, experts do not have unlimited time to participate in research projects. It is difficult, if not impossible, to arrange group meetings where all experts can be present. However, with an online Delphi survey, experts can choose when and where they want to fill in the questionnaire. This gives the respondents far greater flexibility.

Though powerful, the Delphi technique has some limitations. The first critique is the fact that the eventual outcomes of the study are not facts, but are the opinions of a specific group of experts and that a second group going through the exact same process could produce an entirely different set of outcomes (Päivärinta et al., 2011). Second, the definition of expertise and selection of panel members are decisions left to the research team, leading to inherent bias (Von der Gracht, 2008). Anonymity is able to produce honest discussions but also has the potential to produce thoughtless answers as it can lead to a lack of accountability. Third, it is up to the facilitator to decide what feedback to present which can result in the presentation of skewed opinions that may not be representative of the entire group (Skulmoski et al., 2007).

6.3.2 Design of Delphi Questionnaires

Typically, the first Delphi questionnaire design is a brainstorming exercise involving open-ended questions, but brainstorming may also be performed in focus groups or through literature reviews prior to the start of the Delphi process (Okoli and Pawlowski, 2004). The usual result of the brainstorming phase is a long list of items for each open-ended question. Designing the second survey involves compiling and organising these into a list of the most frequent and compelling items that is more manageable for survey participants. The objective of the second survey is to determine which items are the most important which is typically done in one of three ways, namely: (1) participants select a fixed number of items they consider to be important; (2) participants rank items against each other; or (3) participants rate all items on a Likert scale.

Early Delphi studies only used selection and ranking approaches until Watson (1989) performed the first Delphi asking participants to rate issues on a scale. Since then many studies have employed the rating method based on the rationale that human beings have a limited capacity for processing information simultaneously making ranking exercises difficult. Besides being more straightforward, a rating system generates data for each item, can more easily deal with tied items and allows for more detailed statistical analysis.

This research study used a combination of open-ended, closed-ended, rating and ranking types of questions in the first round (*Refer* to Appendix 6 for full questionnaires). However, most of the questions in the second round were quantitative in nature and used a 7-point Likert scale. The open-ended questions were essential to generate elaborative answers, and to allow the participants to explain their positions in relation to the different subjects under investigation. The rating scales were also important. They enabled the researcher to determine when and if, a consensus is reached. An important decision made in the design of the final Delphi survey was how to determine which 1st round items would continue to be rated again in the 2nd round. Items were typically sorted by relative importance based on either the median or the mean rating of expert opinion obtained in the 1st round (Powell, 2003). Lists were then reduced by either keeping all items that obtained a certain minimum rating or by selecting the top few.

6.3.3 Research Sample of Delphi Study

The Delphi study targeted academics and practitioners who were considered to be experts in the areas of sustainability and sustainable innovation. The rationale for using experts is that they are "more likely than non-experts to be correct about questions in their field" (von der Gracht 2008). Also, the quality of data produced by Delphi is directly related to the quality of the participants and therefore careful consideration must be made in defining and selecting appropriate ones (Hsu and Sandford 2007). Linstone and Turoff (1975) suggested that experts should have knowledge of the subject and a desire to participate as a highly knowledgeable person will not be useful if they give no thought to the study. Adler and Zigilio (1996) explained that the ideal expert will be willing, knowledgeable and interested enough to devote time to the Delphi study and must be able to communicate their opinions or the facilitator will spend excessive amounts of time deciphering responses.

Once the type of experts is decided upon, the next step is to decide how many to survey. A review of graduate-level Delphi studies by Skulmoski et al. (2007) concluded that the size of Delphi panels tends to range from 3 to 345 members, with 80% of the studies containing 20-50 members. It is important to note that selecting the appropriate panel size involves tradeoffs. If the panel is too small, the study runs the risk of missing key issues, while too large panels can result in irrelevant arguments, more frequent conflicts and information overload (Rowe and Wright, 2001). As Delphi studies are often plagued by high dropout rates between rounds, another risk of having too small a sample is that these dropouts could significantly change results based on statistical tests.

For this research, all the participants were handpicked and headhunted by the author. The panelists were not selected at random. The experts were nominated based on their knowledge,

experience, and expertise in relation to issues under investigation. Traditionally, this approach to sampling will raise concerns about the validity and reliability of the research methodology. However, representative sampling is inappropriate in Delphi studies because expert opinions are required; and therefore, individual experts have to be targeted specifically.

Both academics and practitioners were invited to participate in the Delphi study. The academic invitees were identified through their publications. Papers exploring the subject of sustainable innovation were reviewed and their relevance to this research was examined. The names of academics whose work was deemed relevant to this research were noted down. The author later identified their direct contact details. Their details were then inputted into an Excel database. The researcher prioritised professors over doctors (PhDs) and doctors over PhD candidates. In other words, if the authors of relevant papers were found to be PhD candidates, further checks were carried out in order to identify their supervisors. In such cases, the supervisors rather than the PhD candidates were invited to participate in the study.

In terms of practitioners, the author identified potential participants by reviewing the sustainability reports of UK universities. UK universities' sustainability reports often have the names and contact details of sustainability directors, managers, officers or champions. If the reports do not have these details, they usually have a direct link to their sustainability webpage where information about sustainability staff is easily accessible. Once the details of potential participants were identified, they were inputted into the same Excel database. Sustainability directors/chairs were prioritised over managers, and managers over officers, and officers over champions because of the author's belief that the more senior participants were, the more knowledgeable they were likely to be about the subjects under investigation.

In total, 101 experts were invited, but only 34 of them participated in the first round. 16 out of the 34 experts were academics and the rest were practitioners. Only 26 experts participated in the second round - 14 academics and 12 practitioners.

6.3.4 Procedure of Delphi Survey

Standard Delphi studies are conducted over three rounds, with studies generally varying from two to five with more unconventional ones using anywhere from one to thirteen (Skulmoski et al., 2007; von der Gracht 2008). Skulmoski et al. (2007) conducted a review of 41 Delphi studies done at a graduate-level and found 29 three-round Delphis, 7 two-round Delphis, 4 four-round studies and a single study employing five Delphi rounds. In general, the number of rounds depends on the amount of time available, whether or not there are pre-determined stopping criteria (e.g. level of consensus) and how long participants remain interested (Hasson

et al., 2000). Too few rounds will produce results that may not be meaningful and too many rounds may exhaust the topic or fatigue and anger participants. Few studies use more than three rounds and in fact, some argue that answers may even decrease in accuracy in rounds four and beyond due to participant fatigue and carelessness (Skulmoski et al., 2007).

In this research, the Delphi procedure was concluded after only two rounds. This was because of two important reasons. Firstly, the number of participants dropped significantly from 34 participants in Round 1, to only 26 respondents in Round 2. The participants did not seem willing to participate in multiple-round survey studies. If the author had gone ahead with the initial plan to conduct as many rounds as possible, it would have been very difficult to secure a sufficient number of participants for a 3rd round, let alone for a 4th or a 5th round. Secondly, consensus was achieved on almost all the issues in the 2nd Round. Therefore, a 3rd round was not necessary after all.

Prior to the commencement of Round 2, the participants were provided with a brief report summarising Round 1's results, noting the key points of agreement and disagreement among experts and clarifying any points of confusion. The decision on how much feedback to provide was a balance between providing enough feedback and providing too much feedback which could anger participants, causing them to drop out. The report contained a minimal amount of feedback and it did not discuss in detail the experts' responses to the open-ended questions as this would have been seen as time-consuming and mentally-tiring. The report also provided numerical feedback, but this was limited to the median and mean ratings of the main issues addressed in the 1st Round. While this may seem like insufficient feedback, many Delphi researchers, including Rowe and Wright (1999), argue that providing too much feedback encourages participants "to conform to the group without actually changing their opinions".

6.3.5 Analysis of Delphi Data

When measuring group opinion using the Delphi method, Rowe and Wright (1999) recommended using statistics that "measure the central tendency of the group opinion, the range of opinions and the level of consensus". Central tendencies in Delphi studies are typically measured through the mean or the median with a small number of studies using the mode (Rowe and Wright, 1999). The choice usually comes down to whether to use the mean or median and ample research is available to support the use of either one as documented in literature reviews performed by Skulmoski et al. (2007). Both mean and median were measured in this study, but it was the median that was finally used as the measure of central tendency due mainly to the fact that using mean values resulted in a large number of ties making it more difficult to use it to distinguish between important and unimportant items.

In rating type Delphi studies, statistics that measure the range of opinions are the standard deviation, inter-quartile range (IQR) (e.g. measure of the spread of responses between the 75th and 25th percentiles), histograms and/or the percentage of respondents answering above or below a certain threshold value (Rowe and Wright, 1999). All of these were computed and explored for each of the Delphi items. Also, a Delphi study must include a statistical measure that describes the level of agreement among experts. Standard deviation and IQR provide some insight into levels of agreement as low values of these statistics mean that experts' ratings tend to be similar. Consensus can also be measured by looking at how certain statistics change between rounds such as changes in mean, changes in standard deviation and changes in IQR (Hasson, et al. 2000). All of these were used to measure consensus in this study.

6.4 Model Validation - The Survey Method

In order to test the research hypotheses, and to empirically validate the proposed 'sustainability diffusion model', primary data needed to collected, organised, analysed and interpreted. There are several options a researcher can choose from to collect primary data. These include, but not limited to: surveys, observations, interviews and experiments (Saunders, 2016). This study used a web-based questionnaire as the main data collection instrument. Use of questionnaires is very popular amongst social scientists, especially those who study the diffusion and adoption of innovations (e.g. Ax and Greve, 2017; Laukkanen, 2016; Derwisch et al., 2016; Damanpour and Gopalakrishnan, 2001; Tsikriktsis et al., 2004). Figure VI-6 highlights the steps which were taken to validate the proposed sustainability diffusion model.

6.4.1 Questionnaire Design

Three different questionnaires had to be designed to test the hypotheses and the proposed model in three different contexts; namely, diffusion of duplex printing (*See* Appendix 7); diffusion of sustainable computing (*See* Appendix 8); and diffusion of sustainability culture (*See* Appendix 9). When designing the questionnaires, two main issues were taken into consideration; namely, structure and disguise. Churchill and Lacobucci (2002: p. 270) explain that structure is concerned with "the degree of standardisation imposed on the questionnaire". In terms of structure, questionnaires can be divided into three categories. The first is a highly structured questionnaire, in which the questions are asked and the respondents choose from completely predetermined responses. The second is a highly unstructured questionnaire in which the questions are "loosely predetermined" and respondents answer them using their own words. The third type involves an intermediate degree of structure since "the questions are fixed but the responses are open-ended" (Churchill and Lacobucci, 2002: p. 270).

Moreover, disguise is defined as "the amount of knowledge about the purpose of a study communicated to a respondent" (Churchill and Lacobucci, 2002: p. 270). In the case of a disguised questionnaire, the purpose of the study is hidden from the respondents. Conversely, in an undisguised questionnaire, the purpose of the study is made clear in the posed questions (Churchill and Lacobucci, 2002).

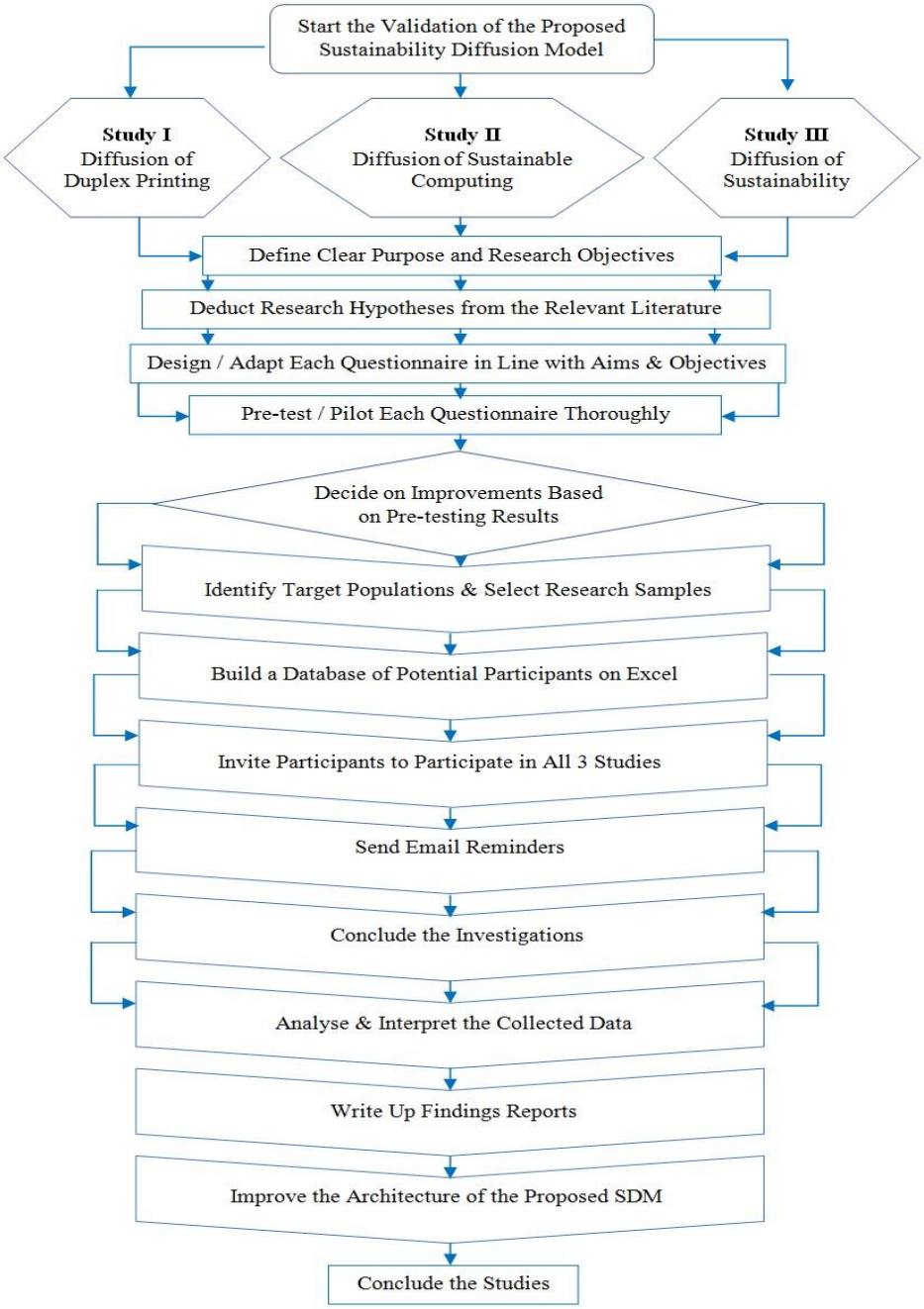


Figure VI - 2: Validation Survey Research Flowchart

This study adopted a structured-undisguised approach to questionnaire design. The questions and responses were all standardised using closed-ended questions with fixed alternative answers from which respondents can choose; five-point Likert scales; and seven-point Likert

scales. The purpose of the study was made clear to the respondents in the information sheet. The structured-undisguised questionnaire is commonly used in social research and has many advantages (Bryman, 2004; Churchill and Lacobucci, 2002), such as:

- Simple and easy to administer
- Suitable for the collection of attitudinal data
- Easier to respond to closed-ended questions
- The fixed-alternative responses improve question clarity
- It facilitates smoother data organisation and analysis processes
- The closed-ended questions improve the comparability of responses
- Closed-ended, fixed-alternative questions elicit a higher response rate

A five-point Likert scale was used to collect data about the attributes of sustainability (i.e. perceived relative advantage, perceived compatibility, perceived complexity, perceived risk, observability, trialability, communicability), while a seven-point Likert scale was used for all the other variables. The two scales are popular among innovation diffusion and persuasive communications researchers (e.g. Hadorn et al., 2016; Gopalakrishnan and Bierly, 2001; Doyle et al., 2014; Forward, 2009).

6.4.2 Pilot Studies

Pilot tests for the self-completion questionnaires were conducted to ensure that they operated well (Bryman, 2004; Churchill and Lacobucci, 2002). The pilot studies were intended to test the internal validity, reliability and content clarity of the questionnaires so that the necessary changes could be made prior to the start of the actual studies. Each questionnaire was thoroughly tested and the necessary changes were made in accordance with the comments, feedback, and suggestions received from the participants. See Appendix 11 for an example of the results produced from the pilot studies.

6.4.3 Sampling

Sampling is an essential stage in conducting any empirical research since it is concerned with drawing up the units from which primary data is collected (Saunders, 2016). Broadly, sampling techniques can be divided into two categories, namely: probability sampling and nonprobability sampling. In the first category, each element of the population has a known chance or probability of being selected in the sample. The sample types in this category are simple random; systematic; stratified random; and multi-stage cluster. In contrast, nonprobability samples imply that there is no specific way to estimate the probability of selecting the units from the population to be included in the sample. In other words, some units

of the population may have a greater chance of being represented in the sample than others. This category includes convenience samples; snowball sampling; and quota sampling (Bryman, 2004; Churchill and Lacobucci, 2002).

This research used a nonprobability sampling approach for the selection of case studies and participants. More specifically, it employed a convenience sampling approach. This means that some case studies and some participants had greater chances of being included in the research sample than others. However, the sampling procedure was systematic. Firstly, a full list of all UK universities was prepared. Secondly, the author thoroughly reviewed the websites of each university, looking for contact details of potential participants. Thirdly, the names, positions and email addresses of potential participants were inputted into an Excel spreadsheet, creating a database of more than 12,000 potential participants. Fourthly, the database was reorganised and arranged alphabetically using Excel's "Sort & Filter" function. This enabled the author to systematically randomise the entire database. For example, all participants with 'Adam' as a first name were positioned in a sequence, but each one of them worked for an entirely different university. The reorganisation of the database, therefore, helped to boost the representativeness of the research sample. Fifthly, all potential participants were emailed individually and were addressed by their first names. Lastly, a reminder was sent out every two weeks only to those participants who have been invited but have not filled in the online survey. The last question in the survey asked the participants to provide their email addresses and that is how the author managed to distinguish those who filled in the questionnaire from those who had not.

The sampling approach used for the selection of case studies and participants for Study II (i.e. Sustainable Computing) was slightly different. Study II was aimed at employees of UK-based service businesses with the intention to diversify the research sample and include participants from sectors or industries other than education in an attempt to boost the generalisability of the research's findings. The idea was to target any person who works in the UK service industry and in a profession that necessitates the use of computers. Therefore, the use of probability sampling as an approach for the selection of case studies and participants was intuitive. The participants were recruited "totally" at random from a random selection of industries. The selection process was, however, systematic. Firstly, websites of service businesses such as accountants, solicitors, letting agencies and employment agencies were identified and put into an Excel spreadsheet. Once a sufficient number of websites was collected, each website was reviewed for direct contact details of persons working for those businesses. Secondly, each person was invited personally and was encouraged to participate in exchange for access to the research's findings. Unfortunately, not a sufficient number of invitees were willing to take part

in the online survey. The author needed to find a solution to this problem. Therefore, thirdly, LinkedIn was used as a recruitment platform. Potential participants were identified and invited instantly. This approach turned out to be much more effective than the first one. However, the total number of participants was not as high as the author had wished. A total of 1,610 people were invited, but only 286 participated. The response rate was approximately 18%.

Overall, the author had a very clear rationale for the selection of case studies and participants. The decision to use 'convenience sampling' for Study I and Study III was based on two very important factors. Firstly, convenience sampling is commonly used by social scientists and specifically by researchers who investigate the diffusion of innovations (e.g. Tigabu et al., 2015). Secondly, the two studies were specifically aimed at UK universities' employees and not every employee had their contact details readily accessible. Hence, it was intuitive to use convenience sampling as those employees whose contact details are on universities' websites had much greater chance of being included in the study. Moreover, the author's decision to use probability sampling for Study II was also justified because every person in the UK service industry had an equal chance of being invited to participate in the study.

6.4.4 Size of the Sample

The sample size is very important as it affects the validity, reliability and generalisability of results. The larger the sample is, the more representative it becomes of the target population. The pilot study helped the researcher to decide on an appropriate sample size. In order to compute the sample sizes for various power levels and errors, the behaviour construct was created by averaging the items that compose it. The mean of the behaviour was found to be 4.63, and the standard deviation was 2.44. The sample size was computed using the following formula:

$$n = \frac{(z_{\alpha} - z_{1-\beta})^2 s^2}{E^2}$$

Where α is the probability of a Type I error, β is the probability of a Type II error, s is the standard deviation and E is the error.

All the computations are made with $\alpha=0.05$ (95% confidence interval). The sample sizes for a power of 80% ($\beta=0.20$) and different error levels are presented in the table below.

Error	Sample Size
1	46
0.5	186
0.4	291

0.3	518
0.2	1166
0.1	4667

The sample sizes for a power of 90% (β=0.10) and different error levels are presented in the following table.

Error	Sample Size
1	62
0.5	249
0.4	390
0.3	694
0.2	1562
0.1	6249

Based on the aforementioned calculations, it was decided that at least 300 participants should take part in each of the three questionnaires in order to generate valid and reliable results.

6.4.5 Method of Distribution and Administration

Several methods of administering the questionnaire were considered including mail, telephone, online, and personal interview (Bryman, 2004; Churchill and Lacobucci, 2002). A decision was made to use an online questionnaire because it offered the level of convenience, efficiency, cost-effectiveness, and flexibility needed to collect data from participants who are situated in geographically dispersed locations. All the participants were sent an invitation email, asking them if they were willing to take part in the three studies. Those who showed interest were emailed back with a link to the online questionnaire. The email also included several attachments; namely, a cover letter; an information sheet; and ethical approval.

6.4.6 Non-Response Bias

There are two types of non-response bias; namely, total non-response and item non-response (Churchill and Lacobucci, 2002). Non-response error refers to "a failure to obtain information from some elements of the population that were selected and designated for the sample" (Churchill and Lacobucci, 2002: p. 528). This can arise from two sources 'not-at-home' and 'refusal'. The not-at-home problem occurs in case of non-receipt of the questionnaire. This problem is likely to happen when carrying out the survey through mail, telephone, or personal interviews. In contrast, the refusal problem occurs if some respondents refuse to complete the questionnaire or cannot do so for some reasons (Churchill and Lacobucci, 2002). The main concern about non-response bias is the error which may arise if those who responded to the questionnaire were different in various ways from those who did not respond (Bryman, 2004).

There are several methods to reduce the total non-response bias such as: (1) reducing the refusals impact by following up with the respondents; and (2) increasing the initial response rate (Bryman, 2004). The author used both methods. The participants were contacted using highly customised personal and intensely persuasive messages. The customisation of emails created a sense of individuality and encouraged many participants to complete the surveys instantly and upon receipt. Follow-up emails were also sent to those who did not complete their questionnaires after two weeks from the initial contact. The follow-up emails were also highly customised and each participant was addressed individually.

Moreover, item non-response bias occurs when the participant does not answer some specific questions because of some aspects of the questionnaire such as the content, form, sequences of the questions, or the amount of work required to complete the questionnaire (Churchill and Lacobucci, 2002). There are two types of item non-response bias. The first is 'flagrant non-response' which occurs when too many questions are left unanswered. In this case, uncompleted questionnaires are considered unusable and removed from the sample. The second type is 'isolated or sporadic non-response' when a few items on questionnaires are unanswered. These questionnaires are considered usable (Churchill and Lacobucci, 2002). Several steps were taken to eliminate the implications of the two forms of item non-response bias. Firstly, so much attention was given to the design and development of the questionnaires' questions. The author made sure that the questionnaires were simple, clear, precise and interesting. Secondly, all the questions were made 'compulsory' which meant that the participants could not submit their questionnaires, if an answer was missing. This helped to entirely eliminate item non-response bias.

6.4.7 Analysis Method of Survey Data

6.4.7.1 Unit of analysis

According to Yin, a unit of analysis and can be anything from an individual or a group to some event or entity (Yin, 2009). Central to this definition is that it should be considered a real-life phenomenon (i.e. within spatial, temporal and other concrete boundaries). The unit of analysis can be, however, held flexible as to its specific definition and delineation, as it may be subject to modification as new discoveries arise during the data collection phase. In this research, the unit of analysis was the 'employee'. The research investigated the factors that influence an employee's willingness to embrace sustainability in the workplace.

6.4.7.2 Statistical Tests

Choosing appropriate methods of statistical analysis represents an important decision for any research which depends upon quantitative analysis, as the statistical analysis should be consistent with the nature of the collected data and research objectives. This research investigated the nature of the relationships between numerous dependent and independent variables. Hence, regression analysis was the primary method of statistical analysis. The present research included two types of dependent variables; namely, dichotomous variables (Yes and No) and continuous variables (Five-Point and Seven-Point Likert Scales). Thus, the logistic regression analysis was used for studying the relationships between the dichotomous variables, and multiple regression analysis was used to study the nature of relationships between the continuous variables. Logistic regression is a form of regression analysis related to multiple regression, but with dichotomous dependent variables (de Vaus, 2002).

6.4.7.2.1 Multiple Regression Analysis

Multiple regression analysis is generally understood as a multivariate statistical technique that is commonly utilised by researchers to study or investigate the nature of relationships between a dependent variable and a group of independent variables (i.e. between an outcome and the predictors of that outcome). There are several types of multiple regression techniques which can be utilised by researchers to generate the desired results. These include standard (Forced Entry) multiple regression; statistical (Stepwise) regression; and hierarchical multiple regression. In the first type, all of the independent variables and their impact/influence on the dependent variable are analysed simultaneously, individually and collectively. The predictive power of individual independent variables is evaluated relative to that of other independent variables. Hence, standard multiple regression is suitable in the case of exploring how much variance in a dependent variable can be explained by a group of variables (Field, 2002).

In the second type, a set of statistical criteria is used to determine the order in which variables are inputted and analysed. Researchers have to decide which variables to include and which ones to omit from the regression model. Their decisions are often based primarily on the statistics generated from a particular sample. Hence, any change or difference in these statistics might have a noticeable impact on the significance of independent variables. Lastly, in hierarchical (sequential) multiple regression, researchers specify the order in which the independent variables are inputted into the model - this is often based upon theoretical grounds. The independent variables are inputted in steps and the predictive power of each variable is assessed individually. Once the entire set of variables is assessed in terms of their

ability to predict the dependent variable, the overall model is examined and the collective power of prediction of all the independent variables is measured.

The use of multiple regression analysis in this research is justifiable and appropriate especially when one considers the nature of the phenomenon under investigation. Pallant (2001: p. 134) explains that the use of multiple regression is most appropriate in investigations that aim to explore: "how well a set of variables is able to predict a particular outcome; which variable in a set of variables is the best predictor of an outcome; and whether a particular predictor variable is still able to predict an outcome when the effects of another variable are controlled".

6.4.7.2.2 Logistic Regression Analysis

Logistic regression is a regression technique similar to multiple regression with one exception that the dependent variable (outcome) is dichotomous (Tabachnick and Fidell, 2001). Similar to multiple regression, there are three main types of logistic regression, namely: standard (Forced Entry); statistical (Stepwise) regression and hierarchical regression. However, Tabachnick and Fidell, (2001: p. 517) argued that "logistic regression is more flexible than the other techniques. Unlike the discriminate function analysis, logistic regression has no assumption about the distribution of the predictor variables; in logistic regression, the predictors do not have to be normally distributed, linearly related, or of equal variance within each group". Hence, logistic regression was used in this research to investigate the relationship between the same independent variables in multiple regression and the adoption/rejection of sustainability (dichotomous variables).

6.4.7.3 Reliability and Validity

de Vaus (2002: p. 17) argued that "data analysis relies on measurements being both reliable and valid". While reliability assesses the consistency of the measure gauging the research concept, validity relies on the accuracy of the measurements through assessing the degree to which the measurement evaluates the intended concept. Hence, research measurements must meet two fundamental criteria: validity and reliability.

6.4.7.3.1 Reliability of Measurements

Reliability refers to the extent to which a measure provides the same results in case of repeating the measurement procedure over time. A reliable instrument is one that is relatively free from measurement errors and can be used in different situations on different occasions. However, it is generally recognised that no measure is free of errors. Stanley (1971: p. 356) argued that "the amount of chance error may be large or small, but it is universally present to some extent. Two sets of measurements of the same features of the same individuals will never

exactly duplicate each other". Despite this fact, reliability is considered a vital criterion for a good measuring instrument. Broadly, there are three types of reliability; namely, stability, equivalence and internal consistency.

The first type of reliability focuses on the stability of measures over time. Stability is sometimes called test-retest reliability. The main method for evaluating this is the test-retest which can be conducted by administering the questionnaire to the same group of respondents on two separate occasions. The correlation between the two scores is calculated to identify the degree to which the responses are stable (Churchill and Lacobucci, 2002). If there is a high correlation between respondents' scores on the two occasions (correlation coefficient equal or exceed 0.7 according to Litwin, 1995) the measures are considered stable and reliable. The second type of reliability is equivalence or alternate-form reliability. It "refers to the extent to which two items measure the same concepts at the same level of difficulty" (Fink, 1995). This type of reliability relies on measuring the same research concept using different measures at different points in time. If the two instruments provide similar results, it could indicate that the measure is reliable (McDaniel and Gates, 1999; Peter, 1979). According to McDaniel and Gates (1999), there are two problems associated with the equivalence method: first, the difficulty, sometimes impossibility, of creating two totally equivalent versions of an instrument. Second, even in a case of creating the equivalence, it might not be worth the time, effort and cost.

The third type of reliability is internal consistency. This method is used to evaluate the reliability of multi-items measures by administering the questionnaire to a sample on a single occasion (de Vaus, 2002). Internal consistency refers to "the degree to which the items that form a scale measure the same issue, characteristics, or research concept" (Fink, 1995). This approach to reliability is an indicator of the internal consistency or the homogeneity among the items of a scale to assess the intended issue. In other words, how well the items that constitute the scale "hang together" (Pallant, 2001: p. 85). Cronbach's alpha is often used to evaluate the internal consistency reliability of the multi-items measure (Bryman, 2001). Cronbach's alpha represents an indicator of the average correlations between all the items combined to form a scale. High value of Cronbach's alpha indicates high reliability.

This study used Cronbach's alpha to evaluate the internal consistency and reliability of the constructs' measurements (*See* Chapter VIII). Most of the measurements had a Cronbach's alpha value of more than 0.7 which was indicative of their reliability.

6.4.7.3.2 Validity of Measurements

Bagozzi, (1994: p. 18) defined validity as "a group of interrelated ideas whose totality capture the essence of the phenomenon under consideration". It is concerned with accuracy and correctness of measurement instruments (Bryman, 2001). Three types of validity are widely used by researchers to evaluate instrument validity, namely: construct validity; criterion validity; and content validity.

Content validity is sometimes called "face validity" (Churchill and Lacobucci, 2002). It relies on the way of defining the concept which the measurement is intended to test. It is not measured numerically. Hence, it is viewed as a subjective measurement "of how appropriate the items seem to a set of reviewers who have some knowledge of the subject matter" (Litwin, 1995: p. 35). In this study, several steps were taken to ensure sufficient context validity. Firstly, the author identified the variable or the concept by reviewing the literature to determine how it is defined and used. Secondly, the author generated a broad group of items that express the defined variable or concept from the reviewed literature. Thirdly, the group items were refined to express the intended concept and then, content validity was assessed by asking experienced people if the measurement reflects the intended concept. The pilot studies have also helped the researcher boost content validity. The participants' suggestions and comments resulted in some items being modified, deleted or reworded to ensure that the instruments reflected the investigated concepts.

Moreover, Litwin, (1995: p. 37) referred to criterion validity as "a measure of how well one instrument stacks up against another instrument or predictor". This approach to validity involves a comparison between measurements of concepts with other existing, well-established measures of the same concepts. This statistic can be carried out by calculating the correlation between the response scores to a new research measure and the scores of a well-established measure which is called a criterion. If the results of the two scores are highly correlated, the new measure is considered to be valid (de Vaus, 1999). The criterion approach to validity was not employed in this study because the questionnaires used well-established measurements which were deducted from the academic literature. In other words, the 'criterion' instruments were used to measure the different concepts.

Furthermore, construct validity is concerned with the degree to which a measurement conforms to the related theoretical issues. In other words, it is concerned with the question of what the construct is, in fact, measuring. According to McDanil and Gates (1999: p. 311), construct validity can be defined as "the degree to which a measurement instrument represents and logically connects, via the underlying theory, the observed phenomenon to the construct".

It comprises two forms of validity, namely: convergent and discriminant. According to McDanil and Gates (1999: p. 311), convergent validity refers to "the degree of association among different measurement instruments that purport to measure the same concept". Similarly, Bagozzi (1994: p. 20) defined discriminant validity as "the degree to which measures of different concepts are distinct". A high correlation between the measures of the same concept indicates their convergent validity, whilst a low correlation between measures designed for different concepts indicates their discriminant validity (Bryman, 2000). This study used factor analysis to assess both types of validity. Factor analysis is used to reduce a set of variables to a few factors through grouping the correlated variables to form a factor. It can also be used to separate variables which are uncorrelated with each other (Burns, 2000).

6.4.7.4 Multicollinearity and Singularity

A multicollinearity problem occurs when two or more independent variables are highly correlated, whereas a singularity problem occurs when there is a perfect correlation between two or more independent variables (Tabachnick and Fidell, 2001). Multicollinearity and singularity cause statistical instability and weaken the regression analysis. Field (2002: p. 131) argued that "high levels of collinearity increase the probability that a good predictor of outcome will be found non-significant and rejected from the model".

This study used the variance inflation factor (VIF) to identify multicollinearity problems. The VIF statistic indicates whether there is a strong linear relationship between an independent variable and others. It is generally recognised that a VIF value of 10 or more indicates a problem of multicollinearity. SPSS produces the values of VIF with multi regression analysis but not with logistic regression. However, Field (2002) suggested that they can be obtained by running a linear multi regression analysis using the same independent variables and the dependent variable of logistic regression. This was done for this study. Moreover, SPSS produces VIF for each independent variable in the regression model (*See* Chapter VIII).

6.4.7.5 Independence of Errors

Independence of errors represents an assumption of regression analysis which should be met. It indicates that the residuals are independent or uncorrelated. Sometimes this assumption is described as a lack of autocorrelation (Tabachnick and Fidell, 2001). Durbin-Watson statistic was used in this study to assess this assumption because it tests correlations between errors.

6.5 Limitations of Survey Research

The use of surveys in general and self-report questionnaires in particular, like other data collection tools, has some limitations. Surveys cannot be used to answer all types of research questions. Research that takes the individual as its unit of analysis, like this one, restricts itself to the explanation of individuals' opinions, attitudes and behaviours. Surveys help researchers to understand why individuals engage in a particular behaviour once it has emerged, but they do not provide much information about the emergence of the behaviour itself (Lesley, 2012). Moreover, surveys might explain some part of the story, but researchers sometimes need more information about the dynamics at the macro level as well. In other words, although they may be associated with several practical limitations or constraints, surveys can be used effectively to answer rather difficult research questions when carefully designed and executed.

Moreover, some scholars have complained about the weak link between self-reports and actual behaviours. It is claimed that self-report questionnaires are prone to bias and inaccuracies. There are several possible sources of bias and inaccuracies when using self-report surveys. For example, there is a tendency among certain sample groups to exaggerate or to hide their real beliefs, attitudes or behaviours especially when they do not conform to the 'socially desirable' norms. There is some evidence suggesting that people have a tendency to over-report or to exaggerate their socially desirable behaviours such as being friend of the environment or being pro-sustainability (See Barr, 2007). According to King and Brunner (2000), social desirability bias exhibited in some self-report questionnaires stems from people's tendency to "present a favourable image of themselves". It is believed that social desirability bias is much more common in socially sensitive research studies than in other research subjects. For example, social desirability was found to have a minimal impact or no impact at all on self-reported pro-sustainability attitudes and behaviours (See Milfont, 2009).

Another source of error or inaccuracy in self-report questionnaires is 'response bias'. Sapsford (2007) referred to response bias as participants' "tendency to respond in a certain way regardless of the question". For example, participants might respond 'yes' or 'agree' to all questions or statements regardless of the actual contents of the questions. This issue affects the reliability of the research instruments and the validity of the collected data - answering 'no' to all statements results in non-acquiescent bias, while answering 'yes' to all questions leads to acquiescent bias. Besides, 'recall error' is a common problem in self-report surveys (Sapsford, 2007). Cross-sectional surveys often ask participants about past events or incidents. Therefore, the quality and accuracy of responses depend greatly on the participants' recall abilities. It is wrong and unrealistic to assume that all participants will be able to vividly recall what exactly

happened a few days, weeks, months or years ago. Most people are only able to recall an abstract version of the realities they had experienced.

Furthermore, the structure of a self-report questionnaire can also affect the reliability of its instruments and the validity of the data collection process. Highly structured and poorly designed questionnaires could incline the respondents to respond in a manner that does not accurately reflect their real beliefs or views (Lesley, 2012). Poorly designed questionnaires tend to reflect a researcher's preconceived notions, which in turn lead to different forms of bias. On the other hand, unstructured questionnaires, particularly those with open-ended questions suffer from higher levels of subjectivity which obliges researchers to perform systematic and complex analysis in order to guarantee the credibility, reliability and validity of the data collection and data analysis processes. Besides, the presence of an observer or a researcher at the time of completion could also affect the validity of self-report data. For example, participants might over-report or hide their real views because they know they are being observed. This could also happen without the presence of an observer such as in online surveys when anonymity is not offered or guaranteed. In such situations, the participants are less likely to select the extreme choices and they are more likely to opt for the more socially desirable choices instead (Lesley, 2012).

It is important to note that the limitations and constraints of self-report questionnaires do not render them unreliable or unusable altogether. All tools and methods of data collection have limitations. There is not a perfect research tool, method or design. The effectiveness, reliability and validity of a particular research tool or instrument are determined by its ability to collect the data needed to answer the research question as accurately as possible. Although self-report instruments suffer from a variety of limitations such as social desirability bias, researchers can overcome some of these limitations by spending enough time on the design of a questionnaire that takes into account all the issues that could undermine the robustness, reliability and validity of the data collection and data analysis process.

The author had taken several steps to ensure the reliability of the measurement instruments and the validity of the collected data. Firstly, the author acknowledged the fact that designing good self-report measures is an art and a craft. The author, therefore, opted for the use of well-established measures rather than designing a new one. It is not uncommon for researchers to use existing questionnaires, or use some of their questions. Secondly, given the complexity of the questionnaire design process, it is highly unlikely that the first draft of a questionnaire will be perfect. Therefore, all questionnaires were pre-tested to identify and address any issues with them, including excessive length, incomprehensibility, and missing questions. The pilot studies

were also used to test the entire administrative procedure in a smaller, but representative sample of the participants before the main studies took place.

Thirdly, responses to behaviour-related variables were measured using 7-point Likert scale in order to boost the accuracy of the collected data. Kormos and Gifford (2014) argued in favour of using 7-point scales, claiming that they are more effective in capturing respondents' actual beliefs, values, views or experiences. They advised that scale points should be seen by the respondents to be "ordinal, progressing meaningfully from one end of the scale to the other and that the meaning of adjacent points should not overlap with one another". Lastly, the participants were offered total anonymity. They were informed their right to participate anonymously, and guarantees were made about the confidentiality of their data. This helped to eliminate social pressure and to minimise the risk of social desirability bias.

6.6 Conclusions

This chapter described how the research's aim and objectives were achieved methodologically. It provided details of the two primary research methodologies which were used to collect the primary data, namely: the Delphi technique and the survey method. The Delphi technique was used for a very specific purpose - that's to verify the proposed 'sustainability diffusion model' and its underlying hypotheses. The use of this method enabled the researcher to make the necessary changes and modifications to the initial model prior to the commencement of the validation / hypothesis-testing process. Similarly, the survey method facilitated the collection of a large amount of quantitative data which was needed to test the proposed hypotheses and to validate the structural architecture of the proposed 'sustainability diffusion model'.

The next chapter presents the findings from the Delphi study. It demonstrates how the opinions, feedback, comments and constructive criticism of experts have been used to improve the initial 'sustainability diffusion model', and to produce a much more practical model.

Chapter VII

Verification of Proposed Sustainability Diffusion Model

7.1 Introduction

This chapter presents the outcomes of a Delphi study whose aim was to verify the theoretical and conceptual propositions put forth in Chapter V, and to improve the structural architecture of the initial 'sustainability diffusion model'. Due to the fact that there are very few studies, if none at all, in the literature that conceptualise sustainability as an innovation or have an innovation diffusion approach to investigating sustainability implementation, a Delphi research methodology was necessary to verify the proposed model before it proceeded to the validation stage. Besides, although the proposed sustainability diffusion model was underlined by strong theoretical and conceptual assumptions, its underlying propositions needed to be put under the scrutiny of sustainability scholars and practitioners. This chapter, therefore, demonstrates how the opinions, comments and constructive criticism of experts were used to improve the conceptual model, and to produce a much more robust and practical model.

7.2 Methodology

This study used a self-completion, online questionnaire. The questionnaire comprised qualitative and quantitative, close-ended and open-ended questions. The quantitative questions asked the experts to score their opinions against a number of statements on a seven-point Likert scale, while the qualitative questions invited the experts to share their opinions about the theoretical foundation and architecture of the proposed model.

The definition of an expert differs from one study to another, depending upon the nature and context of the investigation. This study embraced Cantrill's et al. (1996: p. 69) definition which conceptualises an expert as "any individual with relevant knowledge and experience of a particular topic". The size of the expert panel also depends on the nature of the investigation. However, a typical panel size is often between "seven to twelve members" (Phillips, 2000: p. 193). The larger the panel of experts is, the more accurate the results are.

In this study, 101 experts were invited to participate, resulting in 34 participants taking part in the first round. 16 out of the 34 experts were academics and the rest were practitioners (*See* Table VII-1). The academics come from 10 different countries, namely: Germany (3), Sweden (2), Austria (2), Brazil (2), China (1), Spain (1), Denmark (1), Netherlands (2), USA (1) and Lithuania (1). However, all of the practitioners are UK-based. They all hold sustainability-related positions. Their positions range from being sustainability advisers, officers and co-

ordinators to being managers, directors and chairs of sustainability departments (*See* Table VII-2). The 34 experts who participated in Round 1 were invited to participate again in Round 2, but only 26 participants responded.

	Academics	*Practitioners*	*Total*
Round 1	16 (47%)	18 (53%)	34 (100%)
Round 2	14 (54%)	12 (46%)	26 (100%)
Total	30 (50%)	30 (50%)	60 (100%)

Table VII - 1: Sample Distribution of Delphi Participants by Category

Position	*Frequency (Round 1)*	*Frequency (Round 2)*	*Area of Expertise*
Assistant Professor	4 (12%)	3 (8%)	Eco-Innovation
Professor	2 (6%)	2 (6%)	Eco-Innovation
Senior Research Fellow	7 (21%)	7 (21%)	Eco-Innovation
Research Fellow	3 (8%)	2 (6%)	Sustainability and Innovation
Head of Energy Sustainability	2 (6%)	1 (3%)	Sustainable Management
Sustainability Co-ordinator	2 (6%)	2 (6%)	Sustainable Management
Sustainability Manager	4 (12%)	3 (8%)	Sustainable Management
Sustainability Action Co-Chair	2 (6%)	2 (6%)	Sustainable Management
Director of Sustainability	3 (8%)	1 (3%)	Sustainable Management
Sustainability Officer	2 (6%)	2 (6%)	Sustainability
Sustainability Advisor	3 (8%)	3 (8%)	Sustainability
Total	34 (100%)	26 (100%)	

Table VII - 2: Sample Distribution of Delphi Participants by Position and Expertise

The panelists were not selected at random. They were nominated based on their knowledge, experience, and expertise in relation to sustainability. Traditionally, this approach to sampling will raise concerns about the validity and reliability of the research methodology. However, representative sampling is inappropriate in Delphi studies. This is because, in Delphi studies, expert opinions are required; and therefore, individual experts have to be targeted specifically.

7.3 Results

Initially, the experts were asked whether they thought sustainability was an innovation, a driver of innovations, both; an innovation and driver of innovations or it has nothing to do with innovation. In the 1st round, the majority of the participants (50%) appeared to believe that sustainability is a driver of innovations; 39% believed that it was both; an innovation and driver of innovations; and only 3 participants (11%) considered sustainability to have nothing to do with innovation (*See* Table VII-3). The experts' perception of sustainability as an innovation changed slightly in the 2nd round. Over 61% of the panelists indicated that they are convinced that sustainability is both; an innovation and a driver of innovations. Several

arguments were put forth by the participants to justify why they believe that sustainability is both; an innovation and a driver of innovations. For example, one expert argued that;

> "[...] for many in the field and amongst younger people sustainability is commonly accepted- but for older generations (or at least some) and for those outside of certain fields, it remains an innovation. More importantly, sustainability is a driver of innovation as new solutions are required when human impacts bump up against absolute physical/ecological limits. For example the need to grow my University's scale, ambition and activities needs to be reconciled with ways to deliver an absolute cut in emissions and this tension should drive innovation."

Another expert also argued that;

> "Sustainability sometimes requires different thinking and new business models or technologies; therefore it can be an innovation. Also, to meet the needs of a company often it is necessary to innovate (e.g., moving to zero waste or toxic free product)."

	Is Sustainability An Innovation, Driver of Innovations or Both?	
Round and Statements	*Responses*	*Percentage*
Round 1		
Sustainability Is An Innovation	4	11.76% [n]
Sustainability Is A Driver of Innovations	16	47.06% [n]
Sustainability Is Both, An Innovation and A Driver of Innovations	15	44.12% [n]
Sustainability Has Nothing To Do With Innovation	3	8.82% [n]
Total	34	100%
Round 2		
Sustainability Is An Innovation	2	7.69% [n]
Sustainability Is A Driver of Innovations	8	30.77% [n]
Sustainability Is Both, An Innovation and A Driver of Innovations	16	61.54% [a]
Sustainability Has Nothing To Do With Innovation	0	00.00% [n]
Total	26	100%
Note: [a] = Consensus Achieved; [n] = Consensus Not Achieved		

Table VII - 3: Sustainability as an Innovation and Driver of Innovations

Besides, the experts' perception of sustainability was measured using a 7-point Likert scale against four key defining characteristics of innovation, namely: newness; significance of improvement; magnitude of change and commercial value. In the 1st round, only a minority of panelists (11.76%) perceived sustainability to be new, but it was seen as a driver of significant improvements by the majority (96.3%). Over 64% of the experts perceive sustainability to be a large departure from existing working practices and just over 97% consider it to be commercially viable. However, if the median value of 5 is used as consensus criterion, the experts would appear to have reached consensus in relation to only two characteristics in the 1st round, namely: significance of improvement and commercial value (*See* Table VII-4).

In the 2nd round, the consensus was only reached on the magnitude of change associated with sustainability implementation, but not on its perceived newness. One expert put forth an argument that perhaps explains why there was a lack of consensus on perceived newness;

> "Sustainability is not new. Perhaps the concept sounds new, but the idea is very old. From the beginning, human beings have learned about the benefits of re-using, taking care of the world so that future generations can have a good standard of living. Sometimes we somehow forget about it, but the idea is still there."

Sustainability-Innovation Defining Characteristics								
	Rank							
Round and Statements	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*Median*
Round 1								
Sustainability Is New	12	12	3	3	4	0	0	2.26 [n]
Sustainability Leads to Significant Improvements	0	0	0	1	4	11	18	6.35 [a]
Sustainability Is a Departure From Existing Practices	0	3	3	6	9	11	2	4.82 [n]
Sustainability Is Commercially Viable	0	0	0	1	11	12	10	5.91 [a]
Round 2								
Sustainability Is New	0	4	3	5	6	6	2	4.50 [n]
Sustainability Is a Departure From Existing Practices	1	1	1	4	5	10	4	5.19 [a]

Note: [a] = Consensus Achieved; [n] = Consensus Not Achieved

Table VII - 4: Sustainability and Innovation - The Link

Moreover, a list of 16 different types of innovation was presented to the panelists and they were asked to indicate what kind of innovation they thought sustainability is. The majority of experts consider sustainability to be an organisational innovation (53.57%). This was followed by management innovation (50%). However, no consensus was achieved in the 1st round as the consensus criterion was set to 70% (*See* Table VII-5). The experts' perceptions changed noticeably in the 2nd round. A decisive majority (79.17%) indicated that sustainability is primarily an organisational innovation, but can also be a process innovation, a management innovation and a product innovation.

What Type of Innovation Is Sustainability?		
Round and Statements	*Responses*	*Percentage*
Round 1		
Management Innovation	14	50.00% [n]
Organisational Innovation	15	53.57% [n]
Technical Innovation	9	32.14% [n]
Ideological Innovation	10	35.71% [n]
Product Innovation	11	39.29% [n]
Process Innovation	12	42.86% [n]
Paradigm Innovation	12	42.86% [n]
Service Innovation	10	35.71% [n]

Technological Innovation	9	32.14% [n]
Round 2		
Management Innovation	11	45.83% [n]
Organisational Innovation	19	79.17% [a]
Ideological Innovation	10	41.67% [n]
Product Innovation	10	41.67% [n]
Process Innovation	13	54.17% [n]
Paradigm Innovation	10	41.67% [n]
Note: [a] = Consensus Achieved; [n] = Consensus Not Achieved		

Table VII - 5: Sustainability - An Organisational Innovation

Furthermore, the panelists were asked whether they thought it was justifiable to use Rogers' (1962) innovation-decision process model to help understand the factors that influence the rate of sustainability diffusion. The use of the model received an overwhelming support from the majority of the experts. It is considered the right step forward towards better understanding of the factors that affect, positively or negatively, the adoption and implementation of sustainability initiatives. However, despite the support, there were some reservations about the model's architecture. For example, one participant stated that;

> "[...] I could say 'yes' it's legitimate, but I'm not convinced of the linearity of Roger's model and that differences within organisations (departmental, people's working practices etc) are not well reflected in the model".

Other participants were initially concerned about the lack of a feedback loop, but their concerns were addressed in the final design of the model. For example, two experts stated;

> "[...] There should be an "ideation" stage (feedback loop) linked to "Decision", "knowledge" and "persuasion" where ideas are filtered, prioritised, developed and improved before accepted."

> "I think the model helps to explain the factors and processes involved in working towards implementing an innovation. I would also suggest that the confirmation and implementation phases would also link back to the persuasion and decision processes for amending/creating other innovations."

The experts were also asked whether they considered the merger between Rogers' (1962) model and Ajzen's (1991) theory of planned behaviour was valid from a theoretical and a conceptual point of view. Initially, the results were inconclusive. Although there was not a consensus in the 1st round in relation to the use of Rogers' (1962) model and Ajzen's (1991) theory independently and in isolation, there was an agreement among the participants that the merger between the two theories to study the diffusion of sustainability is conceptually valid.

However, the use of both; Rogers' (1962) model and Ajzen's (1991) theory was decisively supported in the 2nd round (*See* Table VII-6).

The Theoretical Foundation of The Proposed Sustainability Diffusion Model								
	Rank							
Round and Statements	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*Median*
Round 1								
Rogers' (1962) Innovation-Decision Process Model Is a Valid Model To Use To Study the Sustainability-specific Factors That Influence the Rate of Sustainability Diffusion.	0	3	4	8	7	9	3	4.71 [n]
Ajzen's (1991) Theory of Planned Behaviour Is a Valid Theory To Use To Study the Behavioural Factors That Influence the Rate of Sustainability Diffusion.	0	3	1	5	12	11	2	4.97 [n]
Incorporating Ajzen's (1991) Theory of Planned Behaviour into Rogers' (1962) Innovation-Decision Process Model To Create a Sustainability Diffusion Model Is Justifiable.	0	3	0	9	4	14	4	5.12 [a]
Round 2								
Rogers' (1962) Innovation-Decision Process Model Is a Valid Model To Use To Study the Sustainability-specific Factors That Influence the Rate of Sustainability Diffusion.	0	0	3	3	4	7	9	5.62 [a]
Ajzen's (1991) Theory of Planned Behaviour Is a Valid Theory To Use To Study the Behavioural Factors That Influence the Rate of Sustainability Diffusion.	0	1	3	1	7	9	5	5.35 [a]
***Note**:* [a] = Consensus Achieved; [n] = Consensus Not Achieved								

Table VII - 6: Use of Rogers' (1962) Model and Ajzen's (1991) Theory

Lastly, this study sought the participants' opinions in relation to the inclusion of 8 new variables in the final, combined model. This was done quantitatively and qualitatively. Quantitatively, the experts were asked to indicate whether they agree or disagree with 8 statements on a 7-point Likert scale. The statements were related to the new factors that have been added to the model (*See* Table VII-7). All the new constructs received an overwhelming support from the majority of the participants. The consensus was achieved in the 1st round.

Qualitatively, the participants were encouraged to provide comments and feedback and share their opinions on the new constructs. Although the majority of the experts supported the incorporation of the new factors into the final model, several concerns were raised and recommendations provided, by some of the experts. Most of the concerns were related to the complexity and architecture of the model. For example, two of the participants said:

> "I would not remove or add. However, I think there is a level of complexity which is not included and needs to be discussed, which is that there are emotional factors that play a key role in these processes. "Perceived urgency" may appear earlier on in the model even if no action is taken because of the complexity of how this manifests due to emotional factors through or in human beings."

"There's nothing included that I disagree with, but part of me thinks that some of the strength of a model is that is acts to simplify a complex process into something more manageable - and there's a lot going on in this model!"

Incorporation of Additional Constructs Into the Sustainability Diffusion Model								
	Rank							
Round and Statements	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*Median*
Round 1								
(1) A positive perception of the credibility of the source of pro-sustainability messages helps to induce a favourable attitude towards sustainability adoption.	0	0	0	2	4	10	12	6.14 [a]
(2) A positive perception of the argument quality of pro-sustainability messages helps to induce a favourable attitude towards sustainability adoption.	0	0	1	1	4	13	9	6.00 [a]
(3) A positive perception of personal gains (material or non-material gains) from sustainability helps to induce a favourable attitude towards sustainability adoption.	0	0	0	4	4	10	10	5.93 [a]
(4) A perceived risk of failure of a sustainability initiative has a negative impact on individuals' attitudes towards the adoption of that initiative.	0	2	1	1	8	8	8	5.54 [a]
(5) Communicability of sustainability initiatives facilitates their mass adoption	0	0	0	3	2	10	13	6.18 [a]
(6) If non-adoption of a particular sustainability initiative is associated with negative consequences such as hindered promotion chances, employees will be more inclined to adopt it.	0	1	0	3	8	12	4	5.50 [a]
(7) Creating a true sense of urgency of climate change helps to induce a favourable attitude towards sustainability adoption.	0	1	4	4	8	6	5	5.04 [a]
(8) Individuals are more likely to be persuaded of the need for sustainability by a person whom they perceive to have a legitimate right to influence their opinions.	0	0	1	2	4	12	8	5.89 [a]

Note: [a] = Consensus Achieved; [n] = Consensus Not Achieved

Table VII - 7: The 8 Additional Variables

Some experts recommended that the authors should consider expanding the model further to include emotional factors and other variables that may be beyond the control of the unit(s) of adoption. For example, three of the participants recommended:

"To my opinion within "Attitude" and "Intention" there is not only "Self interest" that matters, but also concern about third parties, (altruism) especially when it comes to sustainability"

"To be added: From my experience of promoting sustainability, I believe it may be useful to consider other factors such as: undeclared or even unconscious interests (e.g.: power, futility, "right to consume and pollute"...); also, it is very important to approach resistance to change factors involved in such sustainability adoption (individual and collective factors, such as: cultural and organisational entropy; power and governance management...) [...]"

"Affordability and costs are drivers that may slow or reduce adoption of sustainable practices. Prime examples are cost of renewable energy without subsidies and cost of refurbishing the UK housing stock."

The additional factors/variables which were recommended by the Delphi participants could not be incorporated into our model for two main reasons. First, the model was already too complex; therefore, incorporating more variables would make it far more complicated and very difficult to test and validate empirically. Secondly, some of the recommended variables were incompatible with Rogers' model and Ajzen's theory. They did not fit anywhere on the structural architecture of the proposed model. This is not to say that the recommended variables do not have any impact on people's behavioural intentions or adoption decisions. They just were not compatible with our model.

7.4 Conclusions

The theoretical propositions and the conceptual architecture of the proposed sustainability diffusion model were successfully verified by the Delphi participants. The findings confirmed the conceptual link(s) between sustainability and innovation. The participants agreed that sustainability can be classified as an organisational innovation. They also agreed that innovation diffusion theories apply to sustainability and that the conceptual merger between Rogers' (1962) innovation-decision process model and Ajzen's (1991) theory of planned behaviour is viable. The majority of the experts also indicated that they consider the inclusion of 8 additional variables onto the proposed sustainability diffusion model to be conceptually justifiable. More importantly, the proposed model received an overwhelming support from the majority of the experts. It is considered to be the right step forward towards better understanding of the factors that affect, positively or negatively, the diffusion, adoption and implementation of pro-sustainability initiatives.

Figures VII-1 and VII-2 show the proposed model before and after the verification process.

The next chapter presents the findings from three empirical investigations whose aim was to test the hypotheses that underlie the proposed 'sustainability diffusion model' and validate its structural architecture. The investigations test the proposed model in the context of three pro-sustainability initiatives, namely: sustainable printing; sustainable computing; and the embedment of a sustainability culture in the workplace.

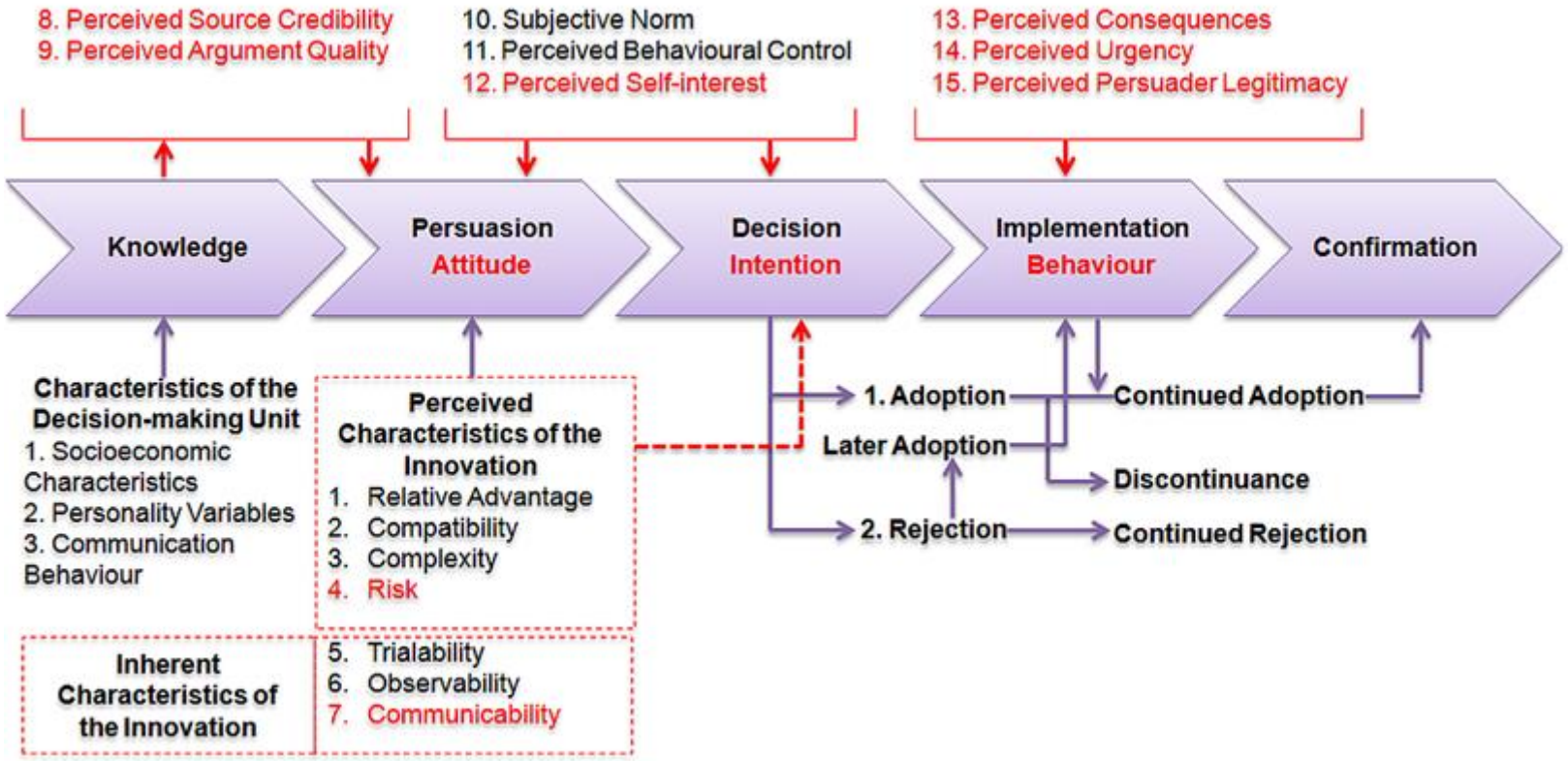


Figure VII- 1: The Initial Version of the Proposed Sustainability Diffusion Model (Before Verification)

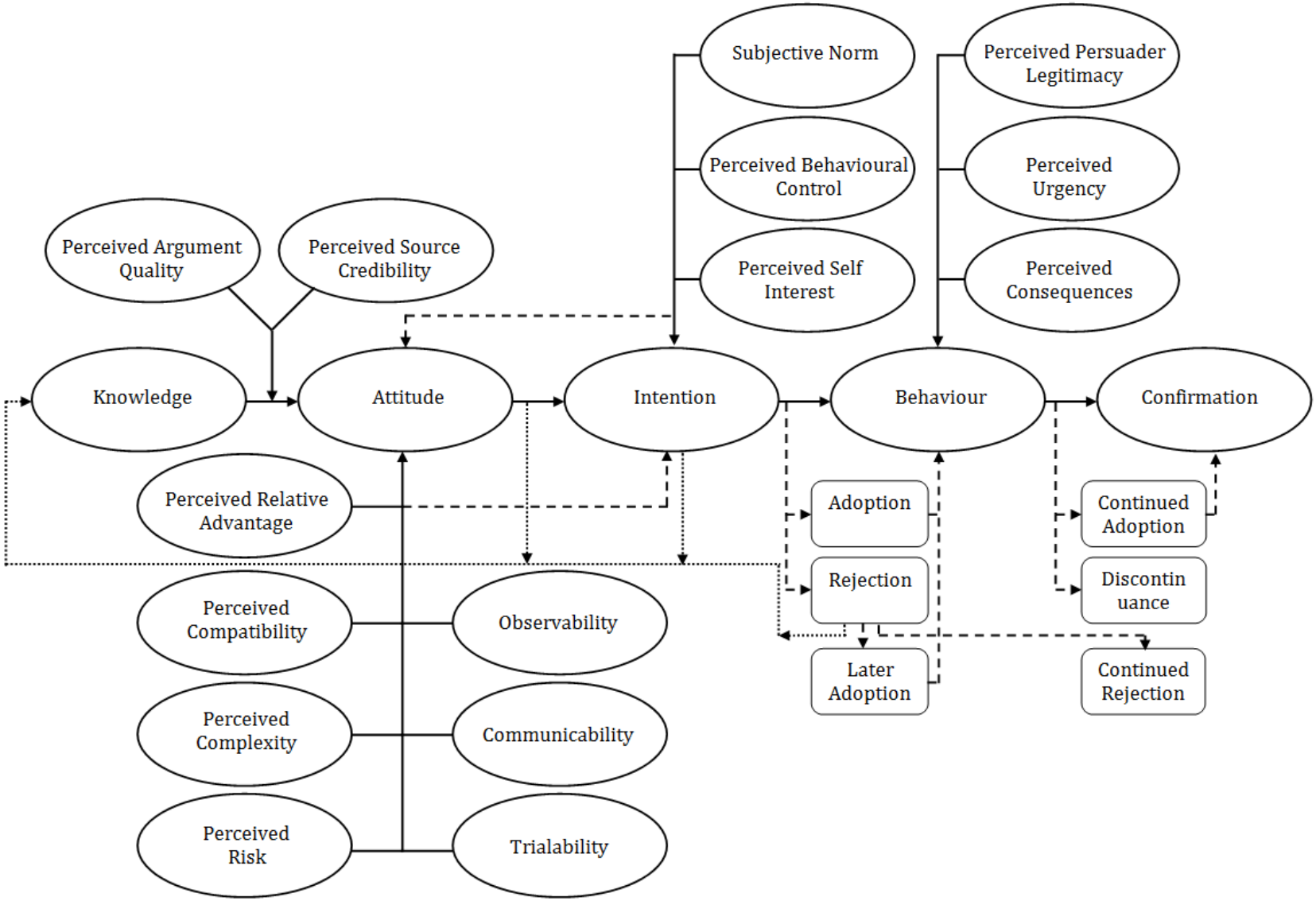


Figure VII- 2: The Improved Version of the Proposed Sustainability Diffusion Model (After Verification)

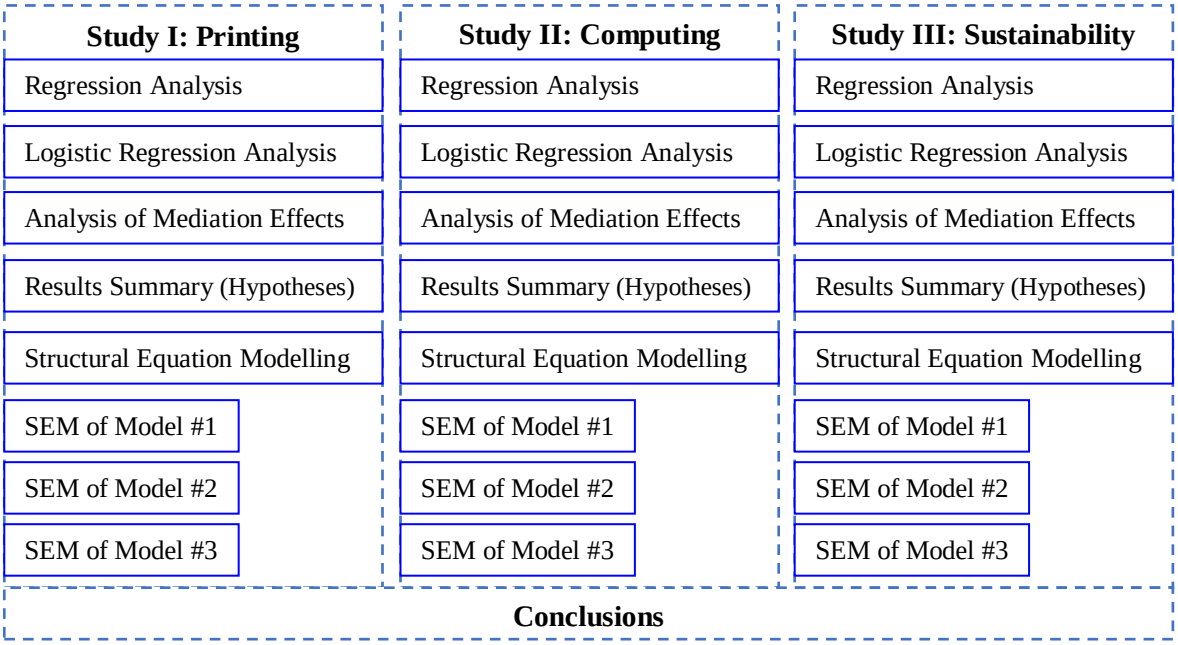
Chapter VIII

Validation of Proposed Sustainability Diffusion Model

8.1 Introduction

This chapter analyses and interprets the data collected for three separate empirical investigations, namely: the diffusion of duplex printing; the diffusion of sustainable computing; and the diffusion of sustainability culture. The three investigations sought to empirically test the research hypotheses put forth in Chapter V and validate the structural architecture of the proposed 'sustainability diffusion model'. They targeted individuals who work in an office environment because they are more likely to use printers and computers for their work. However, two of the studies (i.e. duplex printing and sustainability culture) specifically targeted individuals who work for UK universities. The 'diffusion of sustainability computing' study, on the other hand, targeted any person who uses a computer at work. The aim of the three investigations was not only to gain a greater understanding of sustainability diffusion, test the research hypotheses and validated the proposed model but also to highlight the issues that are central to the collective adoption of sustainability initiatives.

The following flowchart maps out the structure and contents of this chapter:



8.2 Study I: Diffusion of Duplex Printing

The first study investigated the factors/variables that influence the diffusion of sustainable printing in UK universities. There are a number of reasons which explain why this study targeted the employees of UK universities. Firstly, the number of studies that explore the antecedents of pro-environmental behaviour in higher education institutions is noticeably insufficient. This is particularly the case in the context of UK universities. Secondly, universities as knowledge bearers are, or at least should be, on the frontlines in the battle to get the principles of sustainable development diffused and adopted by individuals, organisations, societies and governments. Thirdly, the author believed the employees of UK universities are much more familiar with the concept of sustainability or sustainable development than the employees of other workplace environments. Fourthly, the author perceived higher education institutions, those in the UK in particular, to be active participants in the sustainability agenda at both, the national and international levels.

This study explored whether university employees are inclined to use single-sided or double-sided printing. There are several reasons which justify why this particular 'workplace behaviour' was chosen to be investigated. Firstly, higher education institutions are major consumers of printing paper. In fact, paper consumption is one of the main environmental problems in universities. For example, the University of Yale consumed 211,033 reams of paper in 2011 alone (Ngim, 2013). That is equivalent to 12,662 trees. Secondly, although duplex printing is a better alternative to single-sided printing, it is not itself environmentally friendly. The author thought it was intuitive and perhaps novel, to investigate the diffusion of a behaviour that is preferable, but it is not encouraged. Sustainable universities tend to encourage their employees to go paperless all together instead of switching from single-sided to duplex printing. Thirdly, considering the purpose of this research, the author needed to study the antecedents of a behaviour which employees (i.e. the participants) have total control over their decisions to adopt or reject that behaviour. The printing behaviour of university employees offered exactly that.

The data collected from the employees of UK universities was analysed statistically and was used to test the research hypotheses and to validate the structural architecture of the proposed 'sustainability diffusion model'. A total of 1,950 employees were invited to take part in the study, but only 518 participated and filled in the web-based questionnaire. The response rate was around 26.5%. The majority of the participants were 31-50 years old and the number of female participants was slightly higher than that of male respondents (*See* Figure VIII 1).

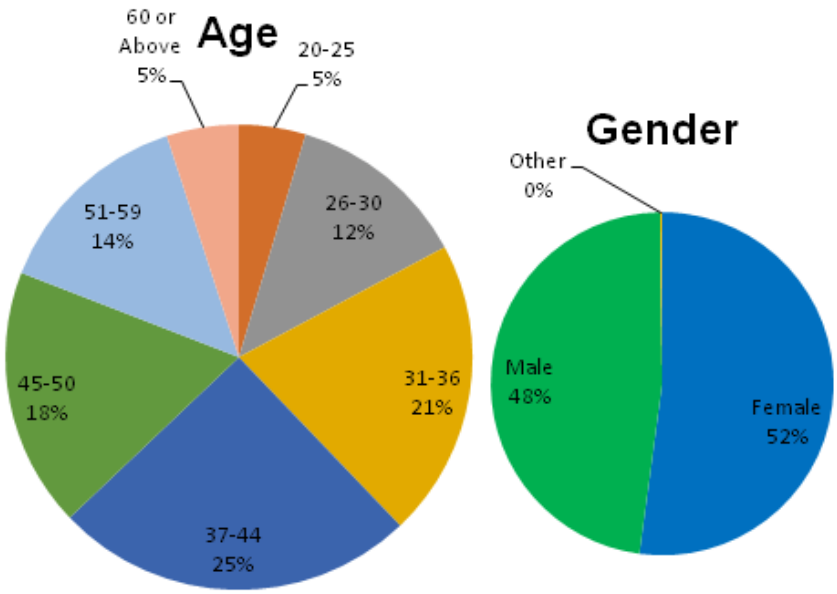


Figure VIII - 1: The Age and Gender of Participants - Study I

Interestingly, the majority of the participants were highly educated with many years of experience - 61% hold PhDs; 20% hold Master's degrees; and 11% Bachelor degrees (*See* Figure VIII 2). In terms of work experience, 37% of the respondents have over 20 years of experience. In terms of job positions, 68% were employees; 14% were line managers, and 12% were senior managers (*See* Figure VIII 2).

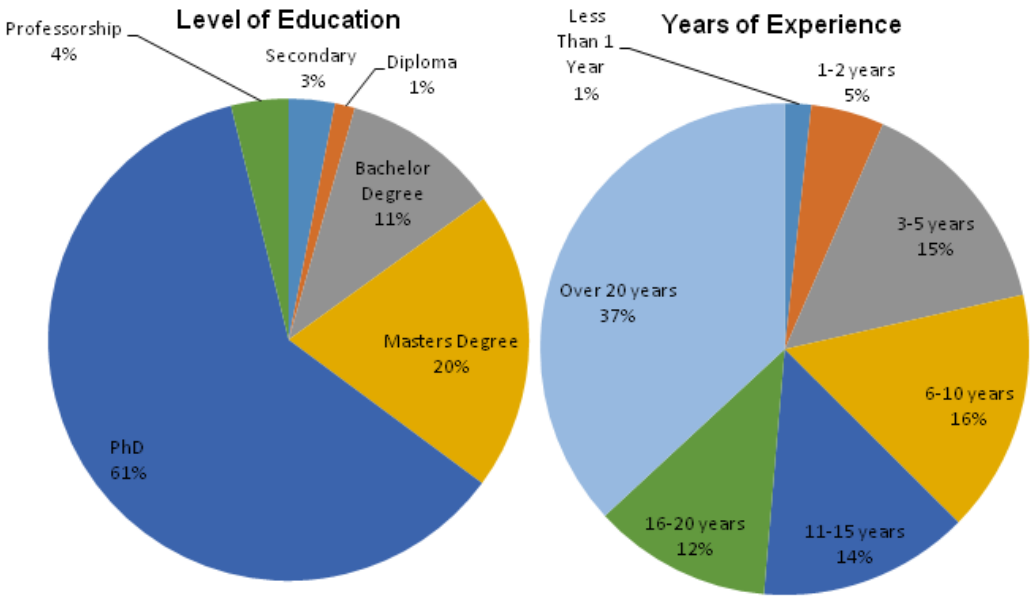


Figure VIII - 2: Participants' Education and Experience - Study I

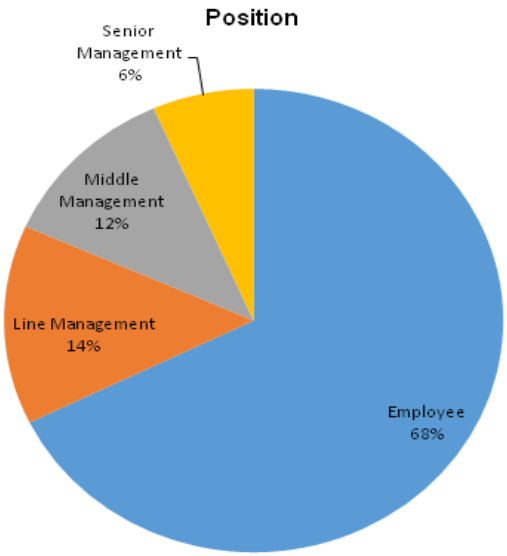


Figure VIII - 3: The Participants' Job Positions - Study I

Prior to the commencement of the data analysis and interpretation process, the questionnaire's constructs' internal consistency was examined again. Internal consistency analysis is commonly used to evaluate the reliability of multi-items measures by administering the questionnaire to a sample on a single occasion (de Vaus, 2002). Internal consistency refers to the degree to which the items that form a scale measure the same issue, characteristics, or research concept (Fink, 1995). This approach to reliability is an indicator of the internal consistency or the homogeneity among the items of a scale to assess the intended issue. In other words, how well the items that constitute the scale "hang together" (Pallant, 2001: 85) Cronbach's alpha is the most widely used method for evaluating the internal consistency reliability of the multi-items measure (Bryman, 2001). Cronbach's alpha represents an indicator of the average correlations between all the items combined to form the scale. A high value of Cronbach's alpha indicates more reliability of the measures.

Although the recommended value of Cronbach's alpha coefficient of a scale is 0.7 or above (de Vaus, 2002), it should be noted that Cronbach's alpha values are sensitive to the number of items used for measuring a construct. If a scale contains a small number of items, the value of Cronbach's alpha can be quite small. In this case, items with item-total correlations of less than 0.30 are recommended to be removed (Pallant, 2001). Table VIII 1 illustrates the outcomes of the internal consistency analysis and the scale reliabilities of different constructs.

Construct	**Cronbach's alpha**	**Internal consistency**
Attitude	0.927	Excellent
Subjective Norm	0.787	Good
Perceived Behavioural Control	0.757	Good
Intention	0.848	Very good
Behaviour	0.886	Very good

Confirmation	0.722	Good
Perceived Relative Advantage	0.722	Good
Perceived Complexity	0.763	Good
Trialability	0.781	Good
Perceived Compatibility	0.870	Very good
Observability	0.633	Acceptable
Communicability	0.899	Very good
Perceived Risk	0.690	Acceptable
Perceived Source Credibility	0.875	Very good
Perceived Argument Quality	0.933	Excellent
Perceived Self Interest	0.874	Very good
Perceived Consequences	0.927	Excellent
Perceived Urgency	0.906	Excellent
Perceived Persuader Legitimacy	0.954	Excellent
Knowledge	0.845	Very good

Table VIII - 1: Scale Reliabilities

8.2.1 Regression Analysis

8.2.1.1 Dependent Variable: Attitude

A regression analysis was performed to determine whether university employees' attitudes towards the use of duplex printing are influenced by the following variables:

- Knowledge
- Interaction Between Knowledge and Perceived Argument Quality
- Interaction Between Knowledge and Perceived Source Credibility
- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Age
- Work Experience
- Education
- Gender
- Position

Before the actual result interpretation, two assumptions were checked; the assumption of independence of errors and the assumption of lack of important multicollinearity. The results of the Durbin-Watson test for independence of errors can be found in Table VIII 2. The DW value (1.980) is comprised between 1.50 and 2.50, so the assumption of independence of errors

is met. The variance inflation factors (VIF) values are presented in Table VIII 3. All the VIF values are lower than 10, indicating that multicollinearity is not an issue for our model.

The adjusted R squared is 0.320 (Table VIII 2). Therefore, the variation in attitude is 32% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 3. By inspecting this Table, we conclude that the following variables have a significant influence on attitude:

- Perceived Relative Advantage (B=0.330, t=4.524, p<0.01).
- Perceived Compatibility (B=0.471, t=5.458, p<0.01).
- Perceived Complexity (B=0.156, t=2.230, p=0.026).
- Communicability (B=0.158, t=2.111, p=0.035).
- Perceived Behavioural Control (B=0.164, t=3.696, p<0.01).
- Age (B=0.117, t=2.203, p=0.028).
- Work Experience (B=-0.132, t=-2.775, p=0.006).

The other variables and interactions do not have a significant influence on attitude (p>0.05).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.586[a]	.343	.320	.98913	1.980

a. Predictors: (Constant), Position, Trialability, Knowledge by perceived argument quality, Gender, Perceived risk, Subjective norm, Education, Perceived behavioral control, Age, Knowledge by perceived souce credibility, Perceived self interest, Communicability, Perceived complexity, Perceived relative advantage, Knowledge, Observability, Perceived compatibility, Work Experience

b. Dependent Variable: Attitude

Table VIII - 2: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	1.247	.586		2.128	.034	.095	2.399		
	Knowledge	-.119	.067	-.081	-1.770	.077	-.251	.013	.627	1.596
	Knowledge by perceived argument quality	.110	.075	.061	1.464	.144	-.038	.257	.758	1.319
	Knowledge by perceived souce credibility	-.072	.079	-.038	-.916	.360	-.228	.083	.781	1.280
	Perceived relative advantage	.330	.073	.217	4.524	.000	.187	.473	.573	1.746
	Perceived compatibility	.471	.086	.306	5.458	.000	.302	.641	.419	2.385
	Perceived complexity	.156	.070	.103	2.230	.026	.019	.294	.619	1.616
	Perceived risk	.043	.062	.030	.688	.492	-.079	.164	.705	1.419
	Observability	.042	.072	.030	.582	.561	-.100	.184	.495	2.020
	Communicability	.158	.075	.104	2.111	.035	.011	.306	.548	1.826
	Trialability	-.017	.054	-.012	-.305	.760	-.124	.090	.854	1.171
	Subjective norm	.054	.038	.060	1.433	.153	-.020	.129	.740	1.351
	Perceived behavioral control	.164	.044	.166	3.696	.000	.077	.251	.657	1.522
	Perceived self interest	-.056	.058	-.042	-.959	.338	-.171	.059	.694	1.441
	Age	.117	.053	.148	2.203	.028	.013	.221	.291	3.431
	Work Experience	-.132	.048	-.192	-2.775	.006	-.226	-.039	.275	3.639
	Education	-.091	.048	-.076	-1.915	.056	-.184	.002	.846	1.182
	Gender	-.149	.092	-.062	-1.617	.107	-.330	.032	.893	1.119
	Position	.026	.052	.020	.490	.624	-.077	.128	.794	1.260

a. Dependent Variable: Attitude

Table VIII - 3: Analysis of Variance Inflation Factors (VIF) and Regression Coefficients

8.2.1.2 Dependent Variable: Behaviour

A regression analysis was performed to determine whether the behaviour (i.e. the use of duplex printing) is influenced by the following variables:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Age
- Work Experience
- Education
- Gender
- Position

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 4. The adjusted R squared is 0.353 (Table VIII 4). Therefore, the variation in behaviour is 35.3% explained by the variation in the independent variables.

The regression coefficients are presented in Table VIII 5. By inspecting this Table, we conclude that the following variables have a significant positive influence on behaviour:

- Perceived Urgency ($B=0.318$, $t=5.752$, $p<0.01$).
- Subjective Norm ($B=0.164$, $t=4.124$, $p<0.01$).
- Perceived Behavioural Control ($B=0.384$, $t=9.886$, $p<0.01$)

The other variables do not have a significant influence on behaviour ($p>0.05$).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.606[a]	.367	.353	1.02123	1.947

a. Predictors: (Constant), Position, Perceived self interest, Gender, Perceived behavioral control, Education, Age, Subjective norm, Perceived urgency, Perceived persuader legitimacy, Perceived consequences, Work Experience

b. Dependent Variable: Behavior

Table VIII - 4: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.385	.399		5.981	.000	1.601	3.168		
	Perceived persuader legitimacy	.043	.052	.036	.827	.409	-.060	.146	.677	1.477
	Perceived urgency	.318	.055	.234	5.752	.000	.209	.426	.757	1.322
	Perceived consequences	-.092	.068	-.070	-1.360	.174	-.226	.041	.475	2.106
	Subjective norm	.164	.040	.172	4.124	.000	.086	.242	.721	1.387
	Perceived behavioral control	.384	.039	.367	9.886	.000	.308	.461	.909	1.100
	Perceived self interest	.138	.073	.097	1.898	.058	-.005	.280	.479	2.090
	Age	-.033	.054	-.039	-.601	.548	-.139	.074	.297	3.371
	Work Experience	-.037	.049	-.051	-.770	.442	-.133	.058	.282	3.541
	Education	.002	.049	.001	.035	.972	-.094	.098	.850	1.176
	Gender	-.113	.095	-.044	-1.192	.234	-.298	.073	.905	1.105
	Position	-.077	.053	-.057	-1.434	.152	-.182	.028	.808	1.238

a. Dependent Variable: Behavior

Table VIII - 5: Analysis of Variance Inflation Factors (VIF) and Regression Coefficients

8.2.1.3 Dependent Variable: Intention

A regression analysis was performed to find out whether the behavioural intention of university employees to use duplex printing is influenced by the following variables:

- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Knowledge
- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability
- Age
- Work Experience
- Education
- Gender
- Position

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 6 and the variance inflation factors (VIF) values are presented in Table VIII 7.

The adjusted R squared is 0.506 (Table VIII 7). Therefore, the variation in intention is 50.6% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 7. By inspecting this Table, we conclude that the following variables have a significant influence on the intention:

- Subjective Norm (B=0.106, t=3.092, p=0.002).
- Perceived Behavioural Control (B=0.121, t=3.026, p=0.003).
- Perceived Relative Advantage (B=0.171, t=2.591, p=0.010).
- Perceived Compatibility (B=0.650, t=8.317, p<0.01).
- Perceived Risk (B=-0.156, t=-2.837, p=0.005). The relationship is negative.
- Communicability (B=0.194, t=2.867, p=0.004).
- Position (B=-0.109, t=-2.307, p=0.021).

The other variables do not have a significant influence on intention (p>0.05).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.722[a]	.522	.506	.89693	2.036

a. Predictors: (Constant), Position, Trialability, Gender, Perceived risk, Subjective norm, Education, Perceived behavioral control, Age, Knowledge, Perceived self interest, Perceived relative advantage, Perceived complexity, Communicability, Observability, Perceived compatibility, Work Experience

b. Dependent Variable: Intention

Table VIII - 6: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	.906	.540		1.678	.094	-.155	1.967		
	Subjective norm	.106	.034	.111	3.092	.002	.039	.174	.741	1.349
	Perceived behavioral control	.121	.040	.115	3.026	.003	.043	.200	.659	1.516
	Perceived self interest	.053	.053	.037	1.010	.313	-.050	.156	.702	1.425
	Knowledge	-.068	.057	-.043	-1.194	.233	-.179	.044	.723	1.383
	Perceived relative advantage	.171	.066	.106	2.591	.010	.041	.301	.574	1.742
	Perceived compatibility	.650	.078	.397	8.317	.000	.497	.804	.420	2.380
	Perceived complexity	.087	.064	.054	1.367	.172	-.038	.212	.620	1.614
	Perceived risk	-.156	.055	-.103	-2.837	.005	-.265	-.048	.732	1.367
	Observability	.083	.065	.056	1.269	.205	-.045	.211	.495	2.019
	Communicability	.194	.068	.119	2.867	.004	.061	.326	.557	1.795
	Trialability	-.028	.049	-.019	-.569	.570	-.124	.069	.865	1.156
	Age	.014	.048	.017	.289	.773	-.081	.108	.292	3.428
	Work Experience	-.022	.043	-.030	-.502	.616	-.106	.063	.276	3.620
	Education	-.005	.043	-.004	-.114	.909	-.089	.080	.848	1.179
	Gender	-.035	.083	-.014	-.423	.672	-.199	.129	.896	1.117
	Position	-.109	.047	-.080	-2.307	.021	-.202	-.016	.794	1.259

a. Dependent Variable: Intention

Table VIII - 7: Analysis of Variance Inflation Factors (VIF) and Regression Coefficients

8.2.1.4 Dependent Variable: Diffusion Rate

A regression analysis was run to determine whether the diffusion rate of duplex printing in UK universities is influenced by the following variables:

- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Knowledge
- Interaction Between Knowledge and Perceived Argument Quality
- Interaction Between Knowledge and Perceived Source Credibility

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 8 and the variance inflation factors (VIF) values are presented in Table VIII 9.

The adjusted R squared is 0.144 (Table VIII 9). Therefore, the variation in diffusion rate is 14.4% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 9. By inspecting this Table we conclude that the following variables have a significant influence on the rate of diffusion:

- Perceived Relative Advantage (B=-0.25, t=-2.749, p=0.006). The relationship is surprisingly negative.
- Perceived Compatibility (B=-0.325, t=-2.931, p=0.004). The relationship is negative.
- Perceived Risk (B=-0.236, t=-3.053, p=0.002). The relationship is negative.
- Observability (B=-0.204, t=-2.217, p=0.027). The relationship is negative.
- Communicability (B=0.256, t=2.663, p=0.008).

- Perceived Persuader Legitimacy (B=-0.174, t=-2.658, p=0.008). The relationship is negative: a one unit increase in the perceived persuader legitimacy leads to 0.174 units decrease in diffusion rate.
- Knowledge (B=0.243, t=2.854, p=0.005) and interaction between knowledge and perceived argument quality (B=0.267, t=2.772, p=0.006). In consequence, the influence of knowledge depends on the level of the perceived argument quality: one unit increase in knowledge leads to an increase in diffusion rate with (0.243+0.267 * Perceived Argument Quality) units.

The other variables and interactions do not have a significant influence on the diffusion rate of duplex printing (p>0.05).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.414[a]	.172	.144	1.221	1.918

a. Predictors: (Constant), Knowledge by perceived souce credibility, Communicability, Perceived persuader legitimacy, Trialability, Perceived complexity, Knowledge by perceived argument quality, Perceived risk, Perceived relative advantage, Subjective norm, Perceived urgency, Perceived behavioral control, Perceived consequences, Knowledge, Observability, Perceived self interest, Perceived compatibility

b. Dependent Variable: When did you start using double-sided printing?

Table VIII - 8: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	6.378	.655		9.741	.000	5.092	7.665		
	Perceived relative advantage	-.250	.091	-.147	-2.749	.006	-.428	-.071	.602	1.661
	Perceived compatibility	-.325	.111	-.186	-2.931	.004	-.543	-.107	.427	2.344
	Perceived complexity	.154	.088	.090	1.755	.080	-.018	.327	.651	1.537
	Perceived risk	-.236	.077	-.149	-3.053	.002	-.388	-.084	.718	1.392
	Observability	-.204	.092	-.132	-2.217	.027	-.384	-.023	.489	2.046
	Communicability	.256	.096	.152	2.663	.008	.067	.445	.530	1.886
	Trialability	.073	.068	.047	1.065	.287	-.061	.207	.865	1.156
	Subjective norm	-.050	.049	-.051	-1.029	.304	-.147	.046	.692	1.444
	Perceived behavioral control	.045	.056	.041	.802	.423	-.065	.154	.665	1.503
	Perceived self interest	-.135	.092	-.091	-1.465	.144	-.315	.046	.445	2.246
	Perceived persuader legitimacy	-.174	.065	-.138	-2.658	.008	-.303	-.045	.637	1.571
	Perceived urgency	.030	.075	.021	.398	.691	-.117	.176	.641	1.560
	Perceived consequences	.109	.083	.080	1.321	.187	-.053	.272	.470	2.126
	Knowledge	.243	.085	.151	2.854	.005	.076	.410	.617	1.621
	Knowledge by perceived argument quality	.267	.096	.131	2.772	.006	.078	.456	.773	1.293
	Knowledge by perceived souce credibility	-.014	.100	-.006	-.139	.890	-.211	.183	.786	1.272

a. Dependent Variable: When did you start using double-sided printing?

Table VIII - 9: Analysis of Variance Inflation Factors (VIF) and Regression Coefficients

8.2.1.5 Independent Variable: Innovative Behaviour

A series of regression analyses were performed to find out whether the innovative behaviour of university employees influences the following variables:

- Attitude
- Intention
- Behaviour
- Diffusion Rate

The results of the analyses are summarised in Table VIII 10 below:

Relationship	Adjusted R square	B	p
Innovative Behaviour → Attitude	0.019	0.176	0.001
Innovative Behaviour → Intention	0.049	0.293	<0.001
Innovative Behaviour → Behaviour	0.029	0.227	<0.001
Innovative Behaviour → Diffusion Rate	0.011	0.155	0.010

Table VIII - 10: Regression Analysis of Innovative Behaviour

The innovative behaviour has a significant, positive impact on attitude (p=0.001): one unit increase in the innovative behaviour determines 0.176 units increase in attitude. Furthermore, the innovative behaviour accounts for 1.9% of the variation in attitude.

The innovative behaviour has a significant, positive impact on intention (p<0.001): one unit increase in the innovative behaviour determines 0.293 units increase in intention. Furthermore, the innovative behaviour accounts for 4.9% of the variation in intention.

The innovative behaviour has a significant, positive impact on behaviour (p<0.001): one unit increase in the innovative behaviour determines 0.227 units increase in behaviour. Furthermore, the innovative behaviour accounts for 2.9% of the variation in behaviour.

The innovative behaviour has a significant, positive impact on the diffusion rate (p=0.010): one unit increase in innovative behaviour determines 0.155 units increase in diffusion rate. Furthermore, the innovative behaviour accounts for 1.1% of the variation in the diffusion rate.

* * *

The goodness-of-fit indicators of the model are presented in Table VIII 11 and Table VIII 12. The Hosmer-Lemeshow test (Table VIII 11) is not statistically significant: $\chi^2(3)=1.971$, p=0.578. In consequence, our model fits the data well (the innovative behaviour satisfactorily explains the dependent variable adoption). The Nagelkerke pseudo R square value (Table VIII 12) is 0.045; therefore, about 4.50% of the variation in the dependent variable is explained by the independent variable.

The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 13. The innovative behaviour has a significant influence on the adoption: B=0.523, Exp(B)=1.688, p=0.005. The relationship is positive: subjects with high innovative behaviour levels have about 168% more chances to adopt the duplex printing compared to the subjects with low innovative behaviour levels.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	1.971	3	.578

Table VIII - 11: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	200.174[a]	.016	.045

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Table VIII - 12: The Nagelkerke Pseudo R Square Value Test

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	ib	.523	.188	7.720	1	.005	1.688	1.167	2.441
	Constant	1.136	.594	3.661	1	.056	3.116		

a. Variable(s) entered on step 1: ib.

Table VIII - 13: Regression Coefficients (B) and Antilogarithms

8.2.2 Logistic Regression Analysis

8.2.2.1 Dependent Variable: Adoption

A binomial logistic regression analysis was run to determine whether the adoption (i.e. university employees' decisions to use duplex printing instead of single-sided printing) is influenced by the following independent variables:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Age
- Work Experience
- Education
- Gender
- Position

The goodness-of-fit indicators of the model are presented in Table VIII 14 and Table VIII 15. The Hosmer-Lemeshow Test (Table VIII 14) is not statistically significant: $\chi^2(8)=9.533$, p=0.299. In consequence, our model fits the data well (the independent variables satisfactorily explain the dependent variable adoption). The Nagelkerke pseudo R square value (Table VIII 15) is 0.370; so, 37% of the variation in the dependent variable is explained by the independent variables.

The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 16. The following variables have a significant influence on adoption (i.e. employees' decisions to use duplex printing) (p<0.05):

- Behavioural Control (B=0.654, Exp(B)=1.924, p<0.01). The relationship is positive: subjects with high perceived behavioural control have 192% more chances to adopt duplex printing compared to the subjects with low perceived behavioural control.

For the following variables, the influence on the adoption is close to significance (p<0.10):

- Subjective Norm (B=0.378, Exp(B)=1.460, p=0.055). The relationship is positive: subjects with high levels of subjective norm have 146% more chances (on average) to adopt duplex printing compared to the subjects with low levels of subjective norm.
- Perceived Self Interest (B=0.822, Exp(B)=2.274, p=0.055). The relationship is positive: subjects with high levels of perceived self interest have 227% more chances (on average) to adopt duplex printing compared to the subjects with low levels of perceived self interest.

The other variables do not have a significant influence on the adoption (p>0.10).

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	9.533	8	.299

Table VIII - 14: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	141.012[a]	.130	.370

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table VIII - 15: The Nagelkerke Pseudo R Square Value Test

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	percpersleg	.387	.271	2.038	1	.153	1.473	.866	2.506
	percurg	.301	.241	1.560	1	.212	1.352	.842	2.169
	perconseq	-.333	.377	.779	1	.377	.717	.342	1.501
	subnorm	.378	.197	3.689	1	.055	1.460	.992	2.148
	percbehc	.654	.148	19.666	1	.000	1.924	1.441	2.569
	perselfint	.822	.433	3.597	1	.058	2.274	.973	5.316
	age	-.276	.256	1.165	1	.280	.759	.460	1.253
	workexp	.065	.231	.078	1	.780	1.067	.678	1.679
	educ	-.366	.341	1.153	1	.283	.693	.355	1.353
	gender(1)	-.644	.496	1.682	1	.195	.525	.198	1.390
	position	-.304	.238	1.638	1	.201	.738	.463	1.175
	Constant	-1.719	2.188	.617	1	.432	.179		

a. Variable(s) entered on step 1: percpersleg, percurg, perconseq, subnorm, percbehc, perselfint, age, workexp, educ, gender, position.

Table VIII - 16: Regression Coefficients (B) and Antilogarithms

8.2.2.2 Dependent Variable: Continued Adoption

A binomial logistic regression analysis was run to determine whether the continued adoption (i.e. whether university employees are likely to continue to use duplex printing instead of single-sided printing in the future) is influenced by the following independent variables:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Age
- Work Experience
- Education
- Gender
- Position

The goodness-of-fit indicators of the model are presented in Table VIII 17 and Table VIII 18. The program warned us that it could not reach a final solution, so the validity of our model is questionable. This could indicate a problem related to complete or quasi-complete separation of cases. This is why the Hosmer-Lemeshow test and the Nagelkerke R square should be interpreted with caution. The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 19. No variable has a significant influence on the continued adoption ($p>0.05$).

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.016	7	1.000

Table VIII - 17: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	8.917[a]	.036	.660

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Table VIII - 18: The Nagelkerke Pseudo R Square Value Test

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	percpersleg	-.078	1.942	.002	1	.968	.925	.021	41.587
	percurg	3.245	2.055	2.495	1	.114	25.672	.458	1439.713
	perconseq	-3.058	2.234	1.874	1	.171	.047	.001	3.746
	age	1.272	2.472	.265	1	.607	3.568	.028	453.760
	workexp	-.050	1.789	.001	1	.978	.952	.029	31.703
	educ	-4.919	4.917	1.001	1	.317	.007	.000	111.981
	gender(1)	16.919	1426.773	.000	1	.991	22274232.42	.000	.
	position	15.673	1475.889	.000	1	.992	6405058.298	.000	.
	Constant	7.040	1476.026	.000	1	.996	1141.091		

a. Variable(s) entered on step 1: percpersleg, percurg, perconseq, age, workexp, educ, gender, position.

Table VIII - 19: Regression Coefficients (B) and Antilogarithms

8.2.2.3 Dependent Variable: Later Adoption

A binomial logistic regression analysis was run to determine whether the later adoption (i.e. whether university employees who do not currently use duplex printing will use it in the future) is influenced by the following independent variables:

- Observability
- Age
- Work Experience
- Education
- Gender
- Position

The goodness-of-fit indicators of the model are presented in Table VIII 20 and Table VIII 21. The Hosmer-Lemeshow Test (Table VIII 20) is not statistically significant: $\chi^2(8)=0.689$, p=1.000. In consequence, our model fits the data well. The Nagelkerke pseudo R square value (Table VIII 21) is 0.403; therefore, about 40% of the variation in the dependent variable is explained by the independent variables). The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 22.

The following variables have a significant influence on the adoption ($p<0.05$):

- Education (B=-2.796, Exp(B)=0.061, p=0.046). The relationship is negative: subjects with higher education have 94% less chances to later adopt the duplex printing compared to the subjects with lower education.

The other variables do not have a significant influence on the later adoption ($p>0.05$).

Note: The results of this analysis should be interpreted cautiously. Though the program has reached a valid solution, the high p value of the Hosmer-Lemeshow test could indicate a situation of quasi-complete separation of the cases.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.689	8	1.000

Table VIII - 20: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	31.940[a]	.058	.403

a. Estimation terminated at iteration number 10 because parameter estimates changed by less than .001.

Table VIII - 21: The Nagelkerke Pseudo R Square Value Test

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	observ	3.007	1.029	8.546	1	.003	20.228	2.694	151.892
	age	.218	.727	.090	1	.765	1.243	.299	5.165
	workexp	-.177	.619	.082	1	.775	.838	.249	2.816
	educ	-2.796	1.399	3.995	1	.046	.061	.004	.947
	gender(1)	-1.262	1.264	.997	1	.318	.283	.024	3.374
	position	-.247	.525	.222	1	.638	.781	.279	2.185
	Constant	8.827	6.012	2.156	1	.142	6815.783		

a. Variable(s) entered on step 1: observ, age, workexp, educ, gender, position.

Table VIII - 22: Regression Coefficients (B) and Antilogarithms

8.2.3 Analysis of Mediation Effects

8.2.3.1 Dependent Variable: Intention and Mediator: Attitude

This section presents the analysis of mediation effects of the variable attitude between the following independent variables and intention, as a dependent variable:

- Knowledge
- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 23 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Knowledge → Attitude → Intention	0.034	2.499	0.012	0.351	0.267	23.9%
Perceived Relative Advantage → Attitude → Intention	0.037	6.879	<0.01	0.836	0.581	30.5%
Perceived Compatibility → Attitude → Intention	0.033	5.789	<0.01	1.087	0.895	17.7%
Perceived Complexity → Attitude → Intention	0.034	-4.077	<0.01	-0.497	-0.356	28.4%
Perceived Risk → Attitude → Intention	0.032	-4.473	<0.01	-0.597	-0.447	25.1%
Observability → Attitude → Intention	0.031	6.682	<0.01	0.734	0.529	27.9%
Communicability → Attitude → Intention	0.034	6.660	<0.01	0.766	0.549	29.3%
Trialability → Attitude → Intention	0.033	2.802	<0.01	0.258	0.166	35.7%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 23: Mediation Analysis - Intention and Attitude

All the mediation effects are statistically significant ($p<0.05$). The strongest mediation effect appears between trialability and intention (35.7% of the total effect). The following relationships are negative:

- Perceived Complexity – Intention
- Perceived Risk – Intention

The other relationships are positive.

8.2.3.2 Dependent Variable: Behaviour and Mediator: Intention

This section presents the analysis of mediation effects of the variable intention between the following independent variables and behaviour, as a dependent variable:

- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 24 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Subjective Norm → Intention → Behaviour	0.029	8.444	<0.01	0.324	0.081	75.0%
Perceived Behavioural Control → Intention → Behaviour	0.029	8.168	<0.01	0.491	0.253	48.5%
Perceived Self Interest → Intention → Behaviour	0.043	8.293	<0.01	0.436	0.078	82.1%

c is the regression coefficient of the direct relationship between the independent and the dependent variable
c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator
The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 24: Mediation Analysis - Behaviour and Intention

All the mediation effects are statistically significant ($p<0.01$). Very strong mediation effects appear between perceived self interest and behaviour, on the one hand (82.1% of the total effect) and subjective norm and behaviour, on the other hand (75% of the total effect). All the relationships between variables are positive.

8.2.3.3 Dependent Variable: Adoption and Mediator: Intention

This section presents the analysis of mediation effects of the variable intention between the following independent variables and adoption, as a dependent variable:

- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 25 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Subjective Norm → Intention → Adoption	0.024	4.871	<0.01	0.652	0.353	45.9%
Perceived Behavioural Control → Intention → Adoption	0.023	4.765	<0.01	0.706	0.482	31.7%
Perceived Self Interest → Intention → Adoption	0.025	4.922	<0.01	0.972	0.488	49.8%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 25: Mediation Analysis - Adoption and Intention

All the mediation effects are statistically significant (p<0.01). The strongest mediation effect appears between perceived self interest and adoption (49.8% of the total effect). All the relationships between variables are positive.

8.2.3.4 Dependent Variable: Continued Adoption and Mediator: Behaviour

This section presents the analysis of mediation effects of the variable behaviour between the following independent variables and adoption, as a dependent variable:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 26 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Perceived Persuader Legitimacy → Behaviour → Continued Adoption	0.036	2.672	<0.01	0.097	0.019	80.4%
Perceived Urgency → Behaviour → Continued Adoption	0.049	2.247	0.025	1.819	1.398	23.1%
Perceived Consequences → Behaviour → Continued Adoption	0.035	2.635	<0.01	-0.391	-1.196	205.9%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 26: Mediation Analysis - Continued Adoption and Behaviour

All the mediation effects are statistically significant ($p<0.05$). The proportion due to mediation for the path Perceived consequences → Behaviour → Continued adoption indicates that there is no direct relationship between perceived consequences and continued adoption (the continued adoption is totally explained by the variable behaviour). The relationship between behaviour and continued adoption is negative. Another strong mediation effect appears between perceived persuader legitimacy and adoption (80.4% of the total effect).

8.2.3.5 Dependent Variable: Later Adoption and Mediators: Attitude, Intention

This section presents the analysis of mediation effects of the variables attitude and intention between observability as an independent variable and later adoption, as a dependent variable.

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 27 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Observability → Attitude → Later Adoption	0.029	2.160	0.032	1.692	1.363	19.4%
Observability → Intention → Later Adoption	0.050	2.793	<0.01	1.692	0.926	45.3%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 27: Mediation Analysis: Later Adoption and Attitude, Intention

All the mediation effects are statistically significant ($p<0.05$). The strongest mediation effect appears between observability and later adoption (45.3% of the total effect). Both relationships between variables are positive.

8.2.4 Structural Equation Modelling

In addition to testing the research hypotheses, this study sought to validate the structural architecture of the proposed 'sustainability diffusion model'. This was done in three sequential steps. In the first step, the structure of Ajzen's Theory of Planned Behaviour was modelled. In the second step, the structure of Rogers' (1983) Innovation-Decision Process Model was modelled. Lastly, the proposed model which combines and expands both Ajzen's theory and Rogers' model was modelled.

8.2.4.1 Structural Model #1

A structural equation model was built in order to verify the relationships between the following latent constructs:

- Attitude Towards Behaviour
- Subjective Norm
- Perceived Behavioural Control
- Intention
- Behaviour

The IBM SPSS Amos software, version 21, was used. The model is shown in Figures VIII 4 and VIII 5. To estimate the model parameters, the maximum likelihood method was employed.

Figure VIII - 4: Ajzen's (1991) Theory of Planned Behaviour

The cutoff values used to assess the goodness-of-fit were as following: for the root mean square error of approximation (RMSEA) – 0.08, for the comparative fit index (CFI) – 0.900, for the standardized root mean square residual (SRMR) – 0.08 and for the χ^2/df ratio – between 1 and 5. The goodness-of-fit statistics for our model are: $\chi^2(57)=267.838$, $p<0.01$, $\chi^2/df=4.699$, RMSEA=0.085, CFI=0.949, SRMR=0.058. Most indices meet the cutoff value (the only exception is RMSEA). In conclusion, our model is a good fit.

The path weights for the measurement model are presented in Table VIII 28.

Path	B	Beta	p
a1 ← Attitude	1	0.941	-
a2 ← Attitude	0.983	0.904	<0.01
a3 ← Attitude	1.000	0.861	<0.01
sn1 ← Subjective Norm	1	0.589	-
sn2 ← Subjective Norm	1.24	0.797	<0.01
sn3 ← Subjective Norm	1.266	0.892	<0.01
pbc1 ← Perceived Behavioural Control	1	0.745	-
pbc2 ← Perceived Behavioural Control	1.272	0.860	<0.01
pbc3 ← Perceived Behavioural Control	0.853	0.583	<0.01
i1 ← Intention	1	0.808	-
i2 ← Intention	1.013	0.906	<0.01
b1 ← Behaviour	1	0.851	-
b2 ← Behaviour	1.056	0.936	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 28: Path Weights

All the weights are statistically significant ($p<0.01$) and all the standardized weights are greater than 0.500. In conclusion, the items are well explained by their underlying factors.

The regression coefficients for the structural (causal) model can be seen in Table VIII 29.

Path	B	Beta	p
Intention ← Attitude	0.435	0.435	<0.01
Intention ← Subjective Norm	0.277	0.243	<0.01
Intention ← Perceived Behavioural Control	0.276	0.243	<0.01
Behaviour ← Intention	0.750	0.749	<0.01
Behaviour ← Perceived Behavioural Control	0.228	0.200	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 29: Regression Coefficient

All the regression coefficients are statistically significant ($p<0.01$), so all the hypotheses concerning the relationships between the latent constructs are supported. Furthermore, all the relationships are positive. From Table VIII 29, we reach to the following conclusions:

- One unit increase in attitude leads to 0.435 units increase in intention
- One unit increase in subjective norm leads to 0.277 units increase in intention
- One unit increase in behavioural control leads to 0.276 units increase in intention
- One unit increase in intention leads to 0.750 units increase in behaviour
- One unit increase in behavioural control leads to 0.228 units increase in behaviour.

Therefore, the architecture of Model #1 is more than satisfactory: all the parameters (coefficients) are significant and almost all goodness-of-fit indicators meet the cutoff value.

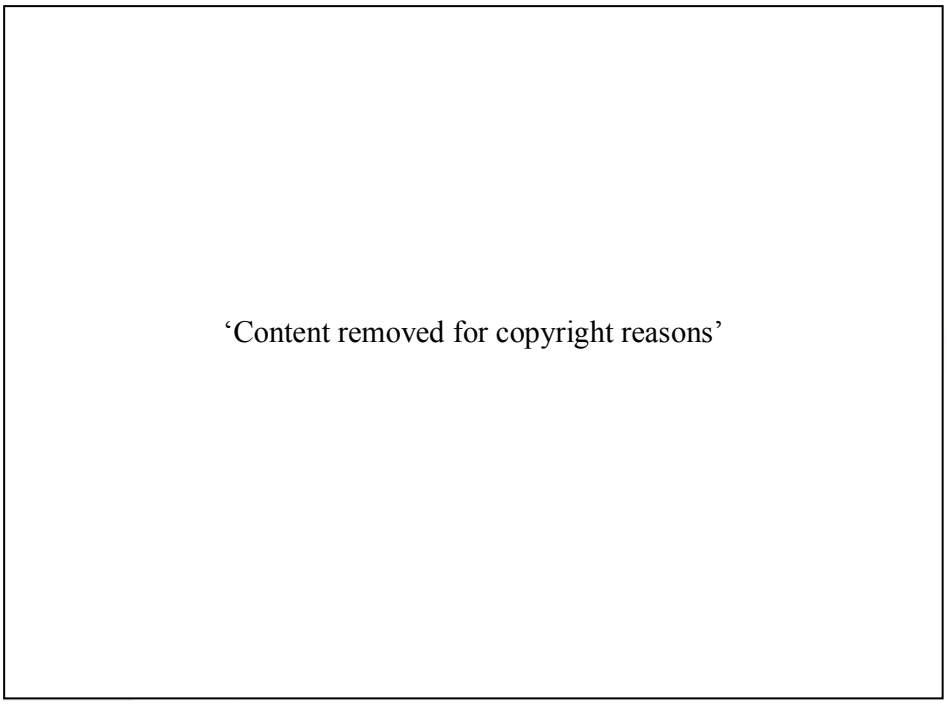


Figure VIII - 5: Structural Modelling of Ajzen's (1991) Theory of Planned Behaviour

8.2.4.2 Structural Model #2

A structural equation model was built in order to verify the relationships between the following latent constructs:

- Knowledge
- Attitude Towards Behaviour
- Intention
- Behaviour
- Confirmation

The model is shown in Figures VIII 6 and VIII 7. To estimate the model parameters, the maximum likelihood method was employed. The cutoff values used to assess the goodness-of-fit were as following: for the root mean square error of approximation (RMSEA) – 0.08, for the comparative fit index (CFI) – 0.900, for the standardised root mean square residual (SRMR) – 0.08, for the χ^2/df ratio – between 1 and 5.

The goodness-of-fit statistics for our model are: $\chi^2(205)=1033.419$, $p<0.01$, $\chi^2/df=5.041$, RMSEA=0.088, CFI=0.894, SRMR=0.059. The only indicator that meets the cutoff value is SRMR. In conclusion, our model is not a very good fit.

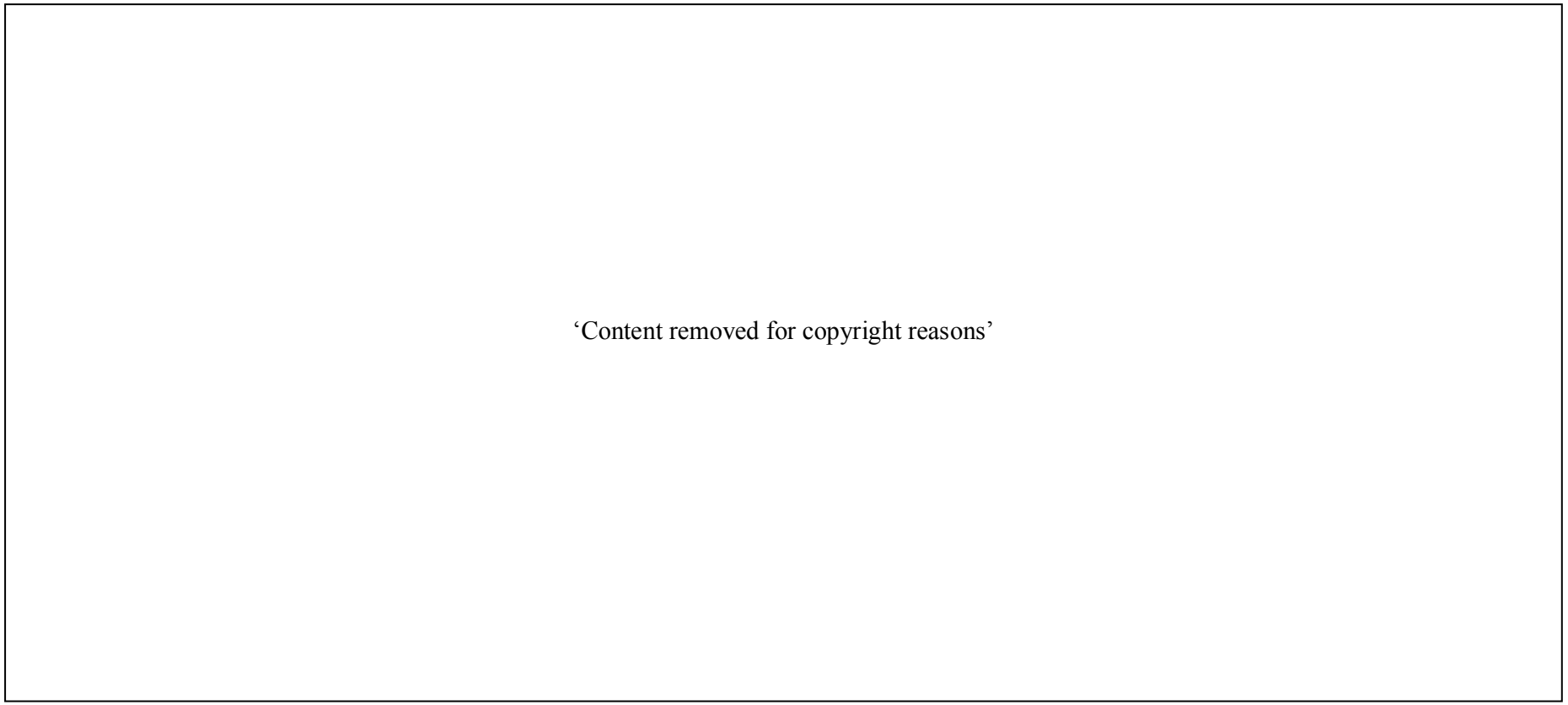


Figure VIII - 6: Rogers' (1983) Innovation-Decision Process Model

The path weights for the measurement model are presented in Table VIII 30.

Path	B	Beta	p
a1 ← Attitude	1	0.943	-
a2 ← Attitude	0.982	0.905	<0.01
a3 ← Attitude	0.993	0.857	<0.01
k1 ← Knowledge	1	0.892	-
k2 ← Knowledge	0.861	0.823	<0.01
pc1 ← Perceived Compatibility	1	0.917	-
pc2 ← Perceived Compatibility	0.961	0.883	<0.01
pc3 ← Perceived Compatibility	0.786	0.726	<0.01
i1 ← Intention	1	0.782	-
i2 ← Intention	1.019	0.881	<0.01
b1 ← Behaviour	1	0.890	-
b2 ← Behaviour	0.953	0.883	<0.01
conf1 ← Confirmation	1	0.962	-
conf2 ← Confirmation	0.706	0.593	<0.01
pcx1 ← Perceived Complexity	1	0.759	-
pcx2 ← Perceived Complexity	0.854	0.839	<0.01
pra1 ← Perceived Relative Advantage	1	0.733	-
pra2 ← Perceived Relative Advantage	0.753	0.462	<0.01
pra3 ← Perceived Relative Advantage	0.707	0.596	<0.01
o1 ← Observability	1	0.740	-
o2 ← Observability	0.778	0.628	<0.01
t1 ← Trialability	1	0.872	-
t2 ← Trialability	0.914	0.737	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 30: Path Weights

All the weights are statistically significant ($p<0.01$) and almost all the standardized weights are greater than 0.500. In conclusion, the items are well explained by their underlying factors.

The regression coefficients for the structural (causal) model can be seen in Table VIII 31.

Path	B	Beta	p
Attitude ← Knowledge	0.015	0.010	0.878
Attitude ← Perceived Complexity	0.163	0.107	0.110
Attitude ← Perceived Compatibility	-1.140	-0.797	<0.01
Attitude ← Perceived Relative Advantage	3.115	1.753	<0.01
Attitude ← Observability	-0.464	-0.297	0.114
Attitude ← Trialability	-0.006	-0.004	0.938
Intention ← Attitude	-0.029	-0.209	0.004
Intention ← Perceived Relative Advantage	0.250	1.023	<0.01
Behaviour ← Intention	7.609	0.994	<0.01
Confirmation ← Behaviour	0.751	0.953	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 31: Regression Coefficients

By visual inspection of Table VIII 31, one can draw the following conclusions:

- The perceived compatibility has a significant, negative impact on the attitude (one unit increase in perceived compatibility leads to 1.140 units decrease in attitude).
- The perceived relative advantage has a significant, positive impact on the attitude (one unit increase in perceived relative advantage leads to 3.115 units increase in attitude).
- The attitude has a significant, negative impact on the intention (a one unit increase in attitude leads to 0.029 units decrease in intention).
- The relative advantage has a significant, positive impact on the intention (one unit increase in perceived relative advantage leads to 0.250 units increase in intention).
- The intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 7.609 units increase in behaviour).
- The behaviour has a significant, positive impact on the confirmation (one unit increase in behaviour leads to 0.751 units increase in confirmation).

The relationships between the other latent constructs are not statistically significant ($p>0.05$).

* * *

The inspection of the modification indices of our model suggested that it would improve (i.e. the chi-square test value would diminish) if the following paths were added to the model:

- Perceived Compatibility – Behaviour
- Perceived Complexity – Behaviour
- Perceived Complexity - Confirmation

The model with the additional paths is shown in Figure VIII 7. This model has much better goodness-of-fit indicators: $\chi^2(202)=890.028$, $p<0.01$, $\chi^2/df=4.406$, RMSEA=0.081, CFI=0.912, SRMR=0.053. However, one must note that the model with the new paths was evaluated from a statistical point of view only, not from a theoretical point of view.

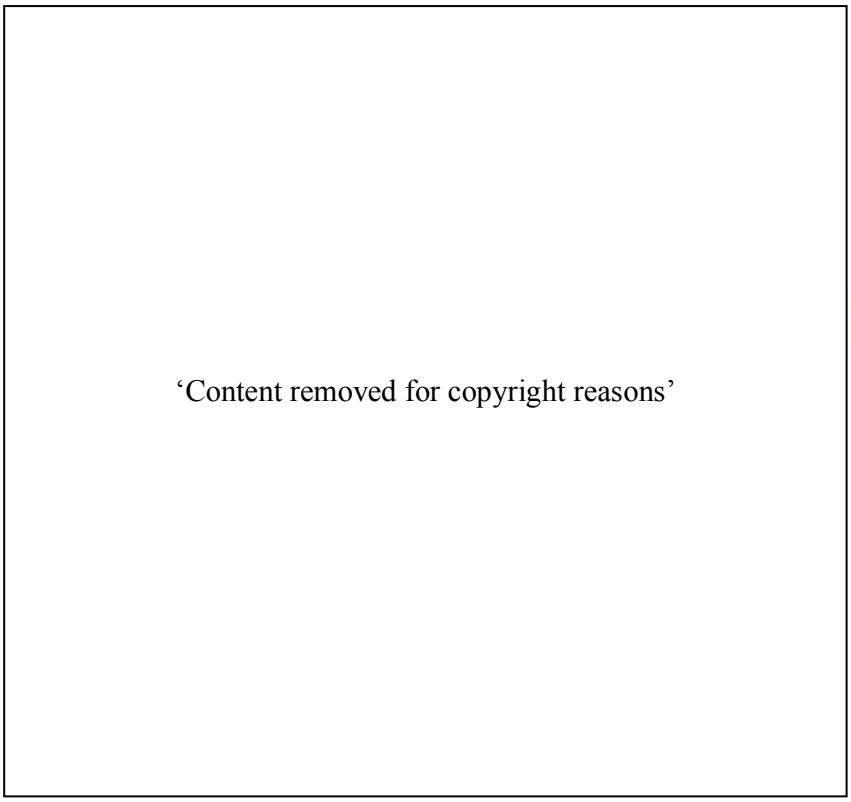


Figure VIII - 7: Structural Modelling of Rogers' (1983) Innovation-Decision Process Model

8.2.4.3 Structural Model #3

A structural equation model was built in order to verify the relationships between the following latent constructs:

- Knowledge
- Attitude Towards Behaviour
- Intention
- Behaviour
- Confirmation

The model is shown in Figure VIII 8. To estimate the model parameters, the maximum likelihood method was employed. The cutoff values used to assess the goodness-of-fit were the following: for the root mean square error of approximation (RMSEA) – 0.08, for the comparative fit index (CFI) – 0.900, for the standardized root mean square residual (SRMR) – 0.08 and for χ^2/df ratio – between 1 and 5.

The goodness-of-fit statistics for our model are: $\chi^2(1015)=3067.195$, $p<0.01$, $\chi^2/df=3.022$, RMSEA=0.063, CFI=0.889, SRMR=0.095. Only two indicators out of four meet the cutoff value; therefore, our model is not a very good fit.

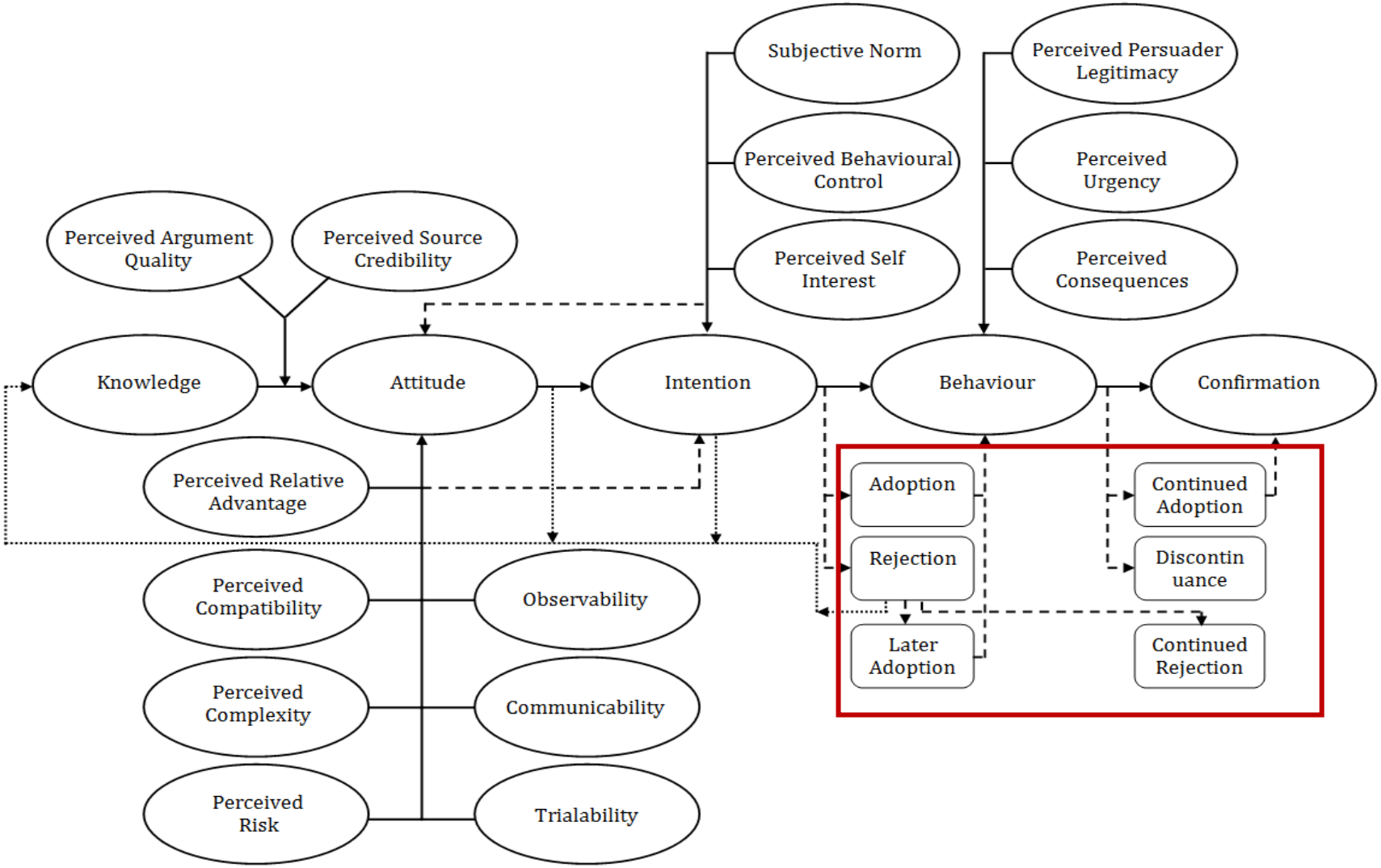


Figure VIII - 8: The Proposed Sustainability Diffusion Model

The path weights for the measurement model are presented in Table VIII 32.

Path	B	Beta	p
a1 ← Attitude	1	0.944	-
a2 ← Attitude	0.978	0.901	<0.01
a3 ← Attitude	0.990	0.853	<0.01
k1 ← Knowledge	1	0.847	-
k2 ← Knowledge	0.883	0.800	<0.01
pc1 ← Perceived Compatibility	1	0.915	-
pc2 ← Perceived Compatibility	0.960	0.881	<0.01
pc3 ← Perceived Compatibility	0.794	0.731	<0.01
i1 ← Intention	1	0.773	-
i2 ← Intention	1.018	0.870	<0.01
b1 ← Behaviour	1	0.891	-
b2 ← Behaviour	0.951	0.882	<0.01
conf1 ← Confirmation	1	0.954	-
conf2 ← Confirmation	0.719	0.599	<0.01
pcx1 ← Perceived Complexity	1	0.838	-
pcx2 ← Perceived Complexity	0.700	0.759	<0.01
pra1 ← Perceived Relative Advantage	1	0.739	-
pra2 ← Perceived Relative Advantage	0.743	0.459	<0.01
pra3 ← Perceived Relative Advantage	0.697	0.591	<0.01
o1 ← Observability	1	0.756	-
o2 ← Observability	0.850	0.655	<0.01
t1 ← Trialability	1	0.851	-
t2 ← Trialability	0.961	0.756	<0.01
pra1 ← Perceived Argument Quality	1	0.905	-
pra2 ← Perceived Argument Quality	0.743	0.931	<0.01
pra3 ← Perceived Argument Quality	0.697	0.886	<0.01
psc1 ← Perceived Source Credibility	1	0.954	-
psc2 ← Perceived Source Credibility	0.833	0.816	<0.01
pr1 ← Perceived Risk	1	0.742	-
pr2 ← Perceived Risk	1.378	0.884	<0.01
pr3 ← Perceived Risk	0.699	0.419	
c1 ← Communicability	1	0.914	-
c2 ← Communicability	0.958	0.893	<0.01
sn1 ← Subjective Norm	1	0.596	-
sn2 ← Subjective Norm	1.219	0.793	<0.01
sn3 ← Subjective Norm	1.250	0.891	<0.01
pbc1 ← Perceived Behavioural Control	1	0.759	-
pbc2 ← Perceived Behavioural Control	1.231	0.847	<0.01
pb3 ← Perceived Behavioural Control	0.831	0.559	<0.01
psi1 ← Perceived Self Interest	1	0.664	-
psi2 ← Perceived Self Interest	1.280	0.948	<0.01
psi3 ← Perceived Self Interest	1.298	0.926	<0.01

ppl1 ← Perceived Persuader Legitimacy	1	0.952	-
ppl2 ← Perceived Persuader Legitimacy	0.975	0.959	<0.01
pu1 ← Perceived Urgency	1	0.911	-
pu2 ← Perceived Urgency	0.992	0.909	<0.01
pcon1 ← Perceived Consequences	1	0.882	-
pcon2 ← Perceived Consequences	0.974	0.864	<0.01
pcon3 ← Perceived Consequences	1.083	0.955	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 32: Path Weights

All the weights are statistically significant ($p<0.01$) and almost all the standardized weights are greater than 0.500. In conclusion, the items are well explained by their underlying factors.

The regression coefficients for the structural (causal) model can be seen in Table VIII 33.

Path	**B**	**Beta**	**P**
Perceived Argument Quality ← Knowledge	0.535	0.572	<0.01
Perceived Source Credibility ← Knowledge	0.330	0.379	<0.01
Attitude ← Perceived Complexity	-0.078	-0.056	0.432
Attitude ← Perceived Compatibility	-0.393	-0.274	0.041
Attitude ← Perceived Relative Advantage	1.844	1.128	<0.01
Attitude ← Observability	-0.416	-0.267	0.101
Attitude ← Trialability	0.044	-0.030	0.571
Attitude ← Perceived Argument Quality	0.087	0.054	0.213
Attitude ← Perceived Source Credibility	0.005	0.003	0.944
Attitude ← Perceived Risk	0.214	0.130	0.051
Attitude ← Communicability	0.091	0.060	0.465
Intention ← Attitude	-0.021	-0.021	0.675
Intention ← Perceived Relative Advantage	1.301	0.826	<0.01
Intention ← Subjective Norm	0.067	0.062	0.130
Intention ← Perceived Behavioural Control	0.145	0.136	0.002
Intention ← Perceived Self Interest	-0.015	-0.009	0.815
Behaviour ← Intention	1.023	0.933	<0.01
Behaviour ← Perceived Persuader Legitimacy	0.122	0.103	0.002
Behaviour ← Perceived Urgency	-0.102	-0.075	0.057
Behaviour ← Perceived Consequences	-0.087	-0.065	0.076
Confirmation ← Behaviour	0.747	0.946	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 33: Regression Coefficients

By visual inspection of Table VIII 33, one can draw the following conclusions:

- The perceived compatibility has a negative impact on the attitude (one unit increase in perceived compatibility leads to 0.393 units decrease in perceived compatibility).
- The perceived relative advantage has a significant, positive impact on the attitude (one unit increase in perceived relative advantage leads to 1.844 units increase in attitude).
- The relative advantage has a significant, positive impact on the intention (one unit increase in perceived relative advantage leads to 1.301 units increase in intention).
- The behavioural control has a significant, positive impact on the intention (one unit increase in perceived behavioural control leads to 0.145 units increase in intention).
- The intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 1.023 units increase in behaviour).
- The persuader legitimacy has a significant, positive impact on the behaviour (one unit increase in perceived persuader legitimacy leads to 0.122 units increase in behaviour).
- The behaviour has a significant, positive impact on the confirmation (one unit increase in behaviour leads to 0.747 units increase in confirmation).

The relationships between the other latent constructs are not statistically significant ($p>0.05$).

* * *

The inspection of the modification indices of our model suggested that it would improve (i.e. the chi-square test value would diminish) if the following paths were added to the model:

- Perceived Relative Advantage – Perceived Argument Quality
- Perceived Compatibility – Perceived Argument Quality
- Observability – Perceived Argument Quality
- Perceived Urgency – Perceived Argument Quality
- Communicability – Perceived Argument Quality.

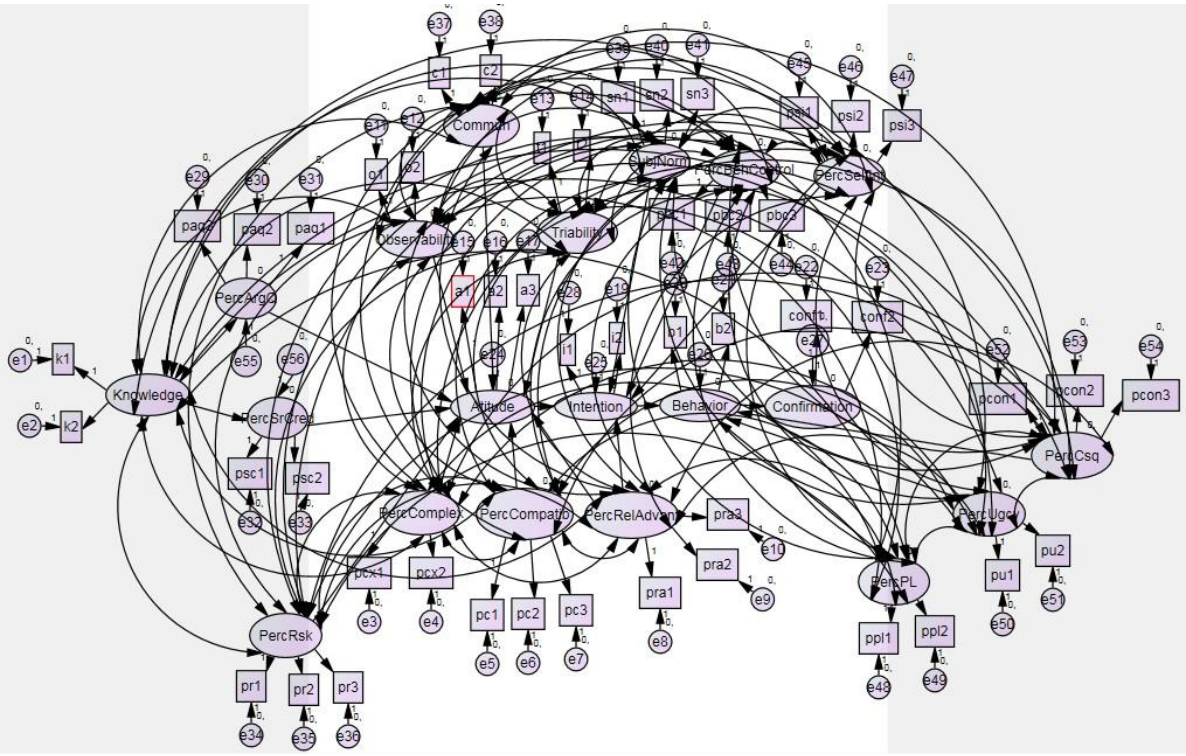


Figure VIII - 9: Structural Modelling of the Proposed Sustainability Diffusion Model - Pre-Modification

A new model was built by introducing the first three paths above (which seem the most theoretically sound). This model (shown in Figure VIII 10) is a very good fit: $\chi^2(1012)=2831.953$, $p<0.01$, $\chi^2/df=2.798$, RMSEA=0.059, CFI=0.901, SRMR=0.069.

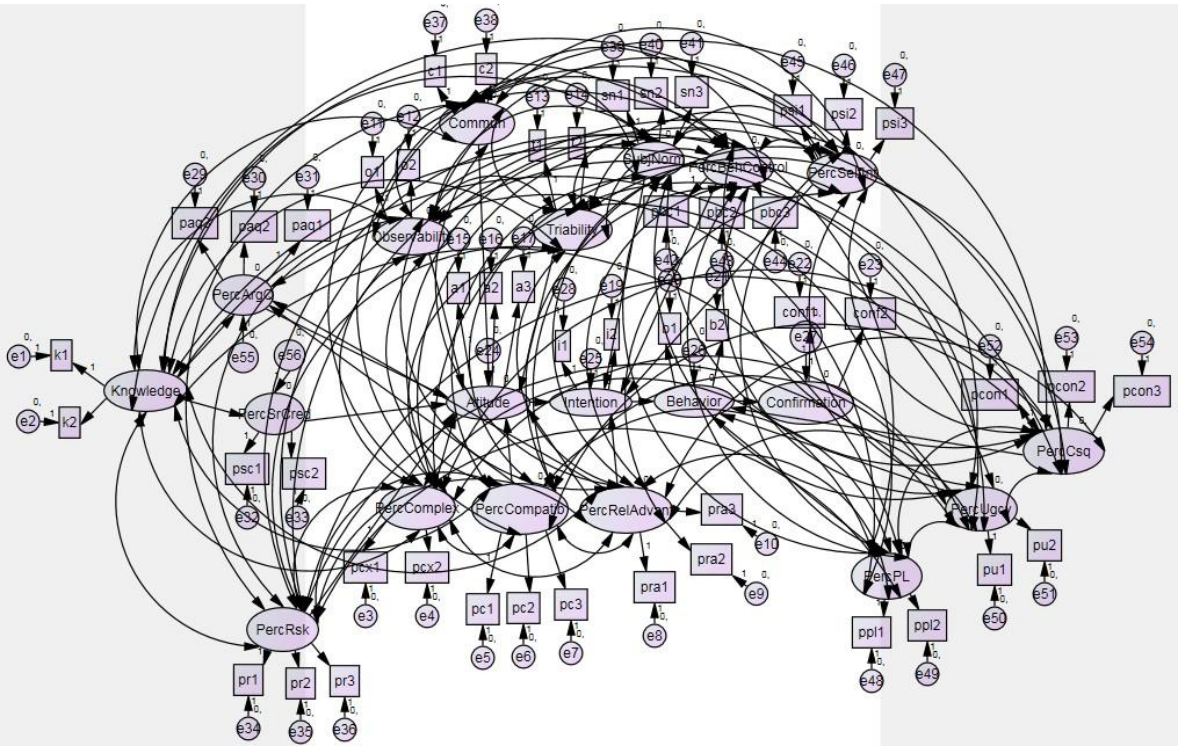


Figure VIII - 10: Structural Modelling of the Proposed Sustainability Diffusion Model - Post-Modification

8.3 Study II: Diffusion of Sustainable Computing

The second study investigated the factors/variables that influence the diffusion of sustainable computing in an office environment. The author defines sustainable computing as any behaviour, practice or initiative that is intended to reduce the energy consumption of personal computers and to mitigate their negative impact on the environment (e.g. switching PCs off each time employees leave their desks). This study explored whether the employees of service-based businesses engage in energy-saving behaviours at work and the factors that influence their willingness to take part in energy-saving initiatives such as sustainable computing. There are several reasons which explain why the author decided to specifically target the employees of service companies in the UK. Firstly, the author needed to diversify the research sample and include participants from sectors or industries other than education in an attempt to boost the generalisability of the research's findings. Secondly, the author sought to better understand the perceptions, attitudes and behavioural intentions of employees who work in sectors or industries which are not necessarily at the forefront of the current struggle against climate change. Thirdly, sustainability implementation studies tend to focus on industries or sectors with the greatest environmental footprint and often neglect the importance of industries with relatively small environmental impact. This study, therefore, is a differentiation from the common trend in the sustainability implementation literature.

The author's decision to study the diffusion of sustainable computing in particular was also informed by a number of important factors. Firstly, the author needed to study the antecedents of a behaviour which employees (i.e. the participants) have total control over their decisions to adopt or reject that behaviour. The computing behaviour of employees offered just that. Secondly, almost every employee in the service industries has access to a computer, but not everyone uses a printer for example. Hence, it made perfect sense to investigate the employees' computing behaviour rather than their printing behaviour. Thirdly, you do not have to be highly educated or be aware of the benefits of sustainability for one to know that switching one's PC off when not in use is an appropriate, energy-saving and cost-saving behaviour. Therefore, the participants did not find it difficult to understand the issues under investigation.

The data collected from the employees of UK businesses was analysed statistically and was used to test the research hypotheses and to validate the structural architecture of the proposed 'sustainability diffusion model'. A total of 1,610 employees were invited to take part in the study, but only 286 participated and filled in the web-based questionnaire. The response rate was approximately 18%. The majority of the participants were 26-44 years old and the number of female participations was slightly higher than that of male respondents (*See* Figure VIII 11).

The majority of the participants hold Bachelor degrees (*See* Figure VIII 12). In terms of work experience, 22% of the respondents have 3-5 years of experience and 19% have over 20 years of experience. In terms of job positions 65% were employees; 18% were line managers; 14% were middle managers; and 3% were senior managers (*See* Figure VIII 13).

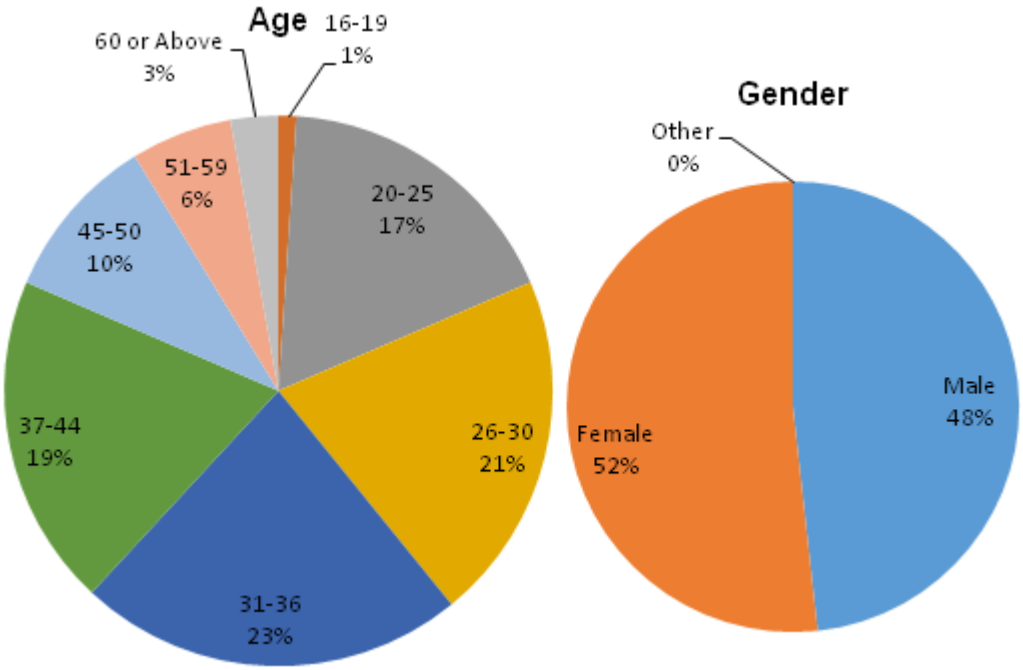


Figure VIII - 11: Age and Gender of Participants - Study II

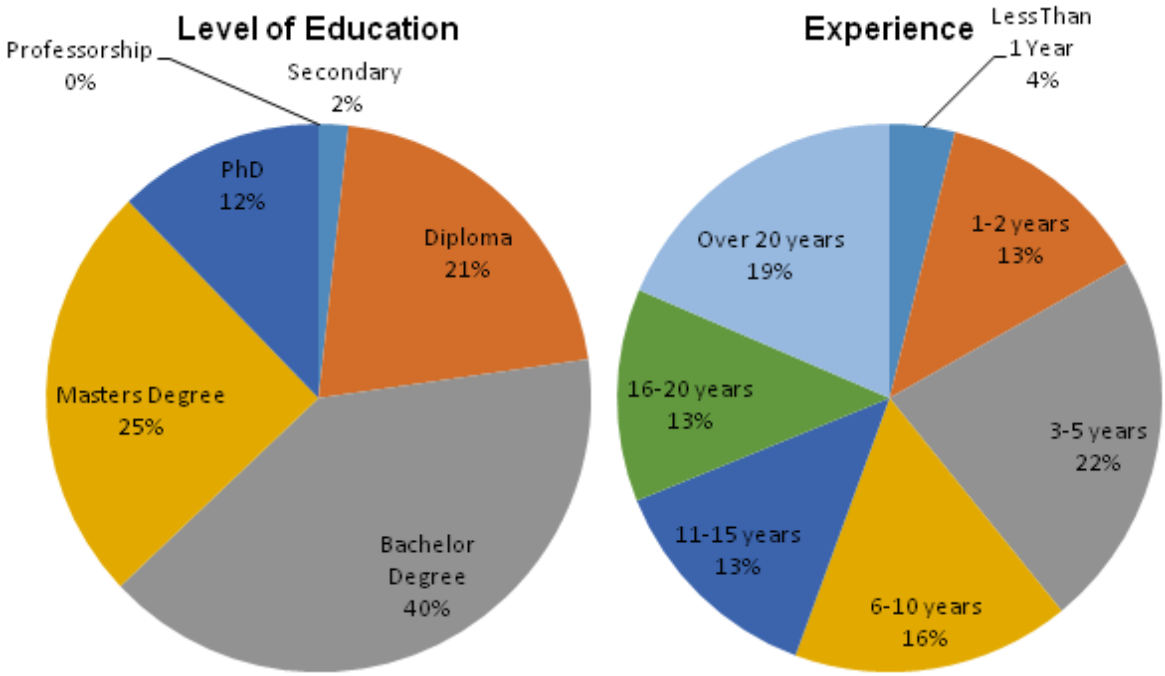


Figure VIII - 12: Education and Experience of Participants - Study II

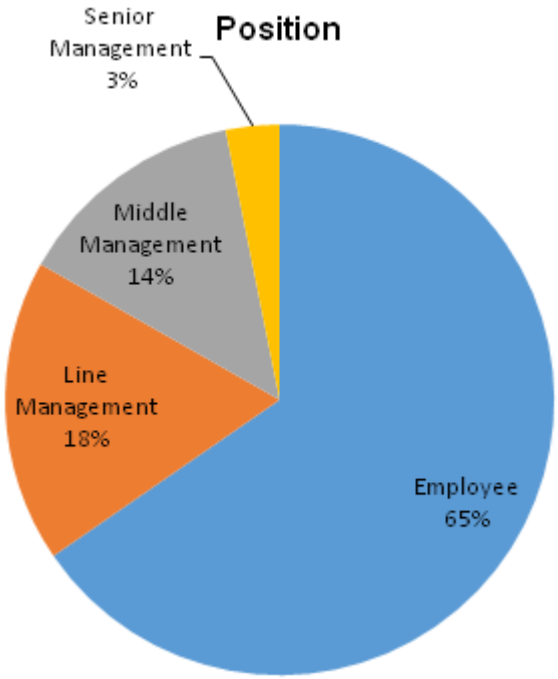


Figure VIII - 13: Job Positions of Participants - Study II

Prior to the commencement of the data analysis and interpretation process, the questionnaire's constructs' internal consistency was examined again. Internal consistency analysis is commonly used to evaluate the reliability of multi-items measures through administering the questionnaire to a sample on a single occasion (de Vaus, 2002). Cronbach's alpha is the most widely used method for evaluating the internal consistency reliability of the multi-items measure (Bryman, 2001). Cronbach's alpha represents an indicator of the average correlations between all the items combined to form the scale. A high value of Cronbach's alpha indicates more reliability of the measures. Although, the recommended value of Cronbach's alpha coefficient of a scale is 0.7 or above (de Vaus, 2002), it should be noted that Cronbach's alpha values are sensitive to the number of items used for measuring a construct. If a scale contains a small number of items, the value of Cronbach's alpha can be quite small. In this case, items with item total correlations of less than 0.30 are recommended to be removed (Pallant, 2001). Table VIII 34 illustrates the outcomes of the internal consistency analysis and the scale reliabilities of different constructs.

Construct	Cronbach's alpha	Internal consistency
Attitude	0.878	Very good
Subjective Norm	0.885	Very good
Perceived Behavioural Control	0.821	Very good
Intention	0.957	Excellent
Behaviour	0.896	Very good
Confirmation	0.849	Very good
Perceived Relative Advantage	0.930	Excellent
Perceived Complexity	0.890	Very good

Trialability	0.635	Acceptable
Perceived Compatibility	0.867	Very good
Observability	0.743	Good
Communicability	0.845	Very good
Perceived Risk	0.823	Very good
Perceived Source Credibility	0.813	Very good
Perceived Argument Quality	0.921	Excellent
Perceived Self Interest	0.875	Very good
Perceived Consequences	0.927	Excellent
Perceived Urgency	0.794	Good
Perceived Persuader Legitimacy	0.946	Excellent
Knowledge	0.923	Excellent

Table VIII - 34: Scale Reliabilities

8.3.1 Regression Analysis

8.3.1.1 Dependent Variable: Attitude

A regression analysis was performed to determine whether the attitude of UK businesses' employees towards sustainable computing is influenced by the following variables:

- Knowledge
- Interaction Between Knowledge and Perceived Argument Quality
- Interaction Between Knowledge and Perceived Source Credibility
- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Age
- Work Experience
- Education
- Gender
- Position

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 35. The variance inflation factors (VIF) values are presented in Table VIII 36.

The adjusted R squared is 0.653 (Table VIII 35). Therefore, the variation in attitude is 65% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 36. By inspecting this Table, we conclude that the following variables have a significant influence on attitude:

- Perceived Relative Advantage (B=0.508, t=6.579, p<0.01).
- Perceived Compatibility (B=0.274, t=3.993, p<0.01).
- Perceived Complexity (B=-0.109, t=-2.154, p=0.032). The relationship is negative.
- Subjective Norm (B=0.156, t=4.228, p<0.01).

The other variables and interactions do not have a significant influence on attitude (p>0.05).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.821[a]	.675	.653	.71430	1.896

a. Predictors: (Constant), Position, Perceived compatibility, Education, Knowledge by perceived source credibility, Trialability, Gender, Perceived risk, Work Experience, Communicability, Perceived self interest, Perceived complexity, Subjective norm, Knowledge by perceived argument quality, Perceived behavioral control, Knowledge, Observability, Perceived relative advantage, Age

b. Dependent Variable: Attitude

Table VIII - 35: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.542	.491		3.140	.002		
	Knowledge	-.003	.056	-.003	-.055	.956	.479	2.088
	Knowledge by perceived argument quality	-.044	.058	-.038	-.761	.448	.498	2.010
	Knowledge by perceived source credibility	-.073	.066	-.051	-1.099	.273	.565	1.770
	Perceived relative advantage	.508	.077	.375	6.579	.000	.375	2.664
	Perceived compatibility	.274	.069	.238	3.993	.000	.343	2.911
	Perceived complexity	-.109	.051	-.103	-2.154	.032	.538	1.860
	Perceived risk	.090	.052	.083	1.732	.084	.524	1.907
	Observability	-.062	.062	-.053	-1.010	.314	.440	2.270
	Communicability	.009	.059	.007	.149	.882	.545	1.834
	Trialability	.050	.054	.038	.931	.353	.740	1.351
	Subjective norm	.156	.037	.198	4.228	.000	.557	1.795
	Perceived behavioral control	.052	.045	.058	1.140	.255	.469	2.133
	Age	-.057	.062	-.076	-.924	.356	.182	5.485
	Perceived self interest	.087	.053	.073	1.640	.102	.614	1.629
	Work Experience	.005	.053	.007	.094	.925	.194	5.144
	Education	.086	.051	.070	1.693	.092	.723	1.383
	Gender	-.121	.096	-.050	-1.264	.207	.776	1.289
	Position	.037	.061	.026	.603	.547	.673	1.487

a. Dependent Variable: Attitude

Table VIII - 36: The Variance Inflation Factors (VIF) and Regression Coefficients

8.3.1.2 Dependent Variable: Intention

A regression analysis was executed to find out whether the behavioural intention of UK businesses' employees' to embrace and operationalise sustainable computing is influenced by the following variables:

- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Knowledge
- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability
- Age
- Work Experience
- Education
- Gender
- Position

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 37. The variance inflation factors (VIF) values are presented in VIII 38.

The adjusted R squared is 0.618 (Table VIII 37). Therefore, the variation in intention is 62% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 38. By inspecting this Table, we conclude that the following variables have a significant influence on the intention:

- Subjective Norm ($B=0.339$, $t=5.794$, $p<0.001$).
- Perceived Behavioural Control ($B=0.153$, $t=2.138$, $p=0.033$).
- Perceived Relative Advantage ($B=0.841$, $t=6.923$, $p<0.001$).
- Perceived Compatibility ($B=0.294$, $t=2.706$, $p<0.007$).
- Perceived Risk ($B=-0.165$, $t=-2.042$, $p=0.042$). The relationship is negative.

The other variables do not have a significant influence on intention ($p>0.05$).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.799[a]	.639	.618	1.13710	1.886

a. Predictors: (Constant), Position, Perceived compatibility, Education, Gender, Trialability, Perceived risk, Work Experience, Communicability, Perceived self interest, Perceived complexity, Subjective norm, Knowledge, Perceived behavioral control, Observability, Perceived relative advantage, Age

b. Dependent Variable: Intention

Table VIII - 37: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.223	.715		-.311	.756		
	Subjective norm	.339	.059	.283	5.794	.000	.562	1.780
	Perceived behavioral control	.153	.071	.114	2.138	.033	.475	2.104
	Perceived self interest	.122	.084	.068	1.457	.146	.616	1.624
	Knowledge	-.077	.087	-.046	-.888	.375	.500	2.002
	Perceived relative advantage	.841	.121	.409	6.923	.000	.385	2.600
	Perceived compatibility	.294	.109	.168	2.706	.007	.347	2.881
	Perceived complexity	.058	.080	.036	.718	.473	.543	1.843
	Perceived risk	-.165	.081	-.101	-2.042	.042	.551	1.815
	Observability	-.116	.098	-.065	-1.180	.239	.443	2.255
	Communicability	.039	.093	.020	.416	.678	.555	1.803
	Trialability	-.143	.085	-.071	-1.695	.091	.755	1.325
	Age	-.160	.098	-.140	-1.632	.104	.183	5.475
	Work Experience	.096	.084	.095	1.143	.254	.195	5.138
	Education	-.021	.079	-.011	-.262	.794	.756	1.323
	Gender	.096	.150	.026	.639	.523	.801	1.249
	Position	-.107	.096	-.049	-1.111	.268	.686	1.458

a. Dependent Variable: Intention

Table VIII - 38: The Variance Inflation Factors (VIF) and Regression Coefficients

8.3.1.3 Dependent Variable: Behaviour

A regression analysis was performed to determine whether the behaviour (i.e. the actualisation of sustainable computing) is influenced by the following variables:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Age
- Work Experience
- Education
- Gender
- Position

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 39. The variance inflation factors (VIF) values are presented in VIII 40.

The adjusted R squared is 0.484 (Table VIII 39). Therefore, the variation in behaviour is 48% explained by the variation in the independent variables. The regression coefficients are presented in VIII 40. By inspecting this Table, we conclude that the following variables have a significant influence on the behaviour:

- Perceived Persuader Legitimacy (B=0.199, t=2.231, p=0.027).
- Perceived Urgency (B=0.481, t=4.226, p<0.01).
- Subjective Norm (B=0.218, t=3.196, p=0.002).
- Perceived Behavioural Control (B=0.477, t=4.006, p<0.01).
- Gender (B=-0.461, t=-2.620, p=0.009).

The other variables do not have a significant influence on behaviour (p>0.05).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.710[a]	.504	.484	1.36158	2.003

a. Predictors: (Constant), Position, Perceived consequences, Education, Perceived behavioral control, Gender, Work Experience, Subjective norm, Perceived persuader legitimacy, Perceived urgency, Perceived self interest, Age

b. Dependent Variable: Behavior

Table VIII - 39: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.576	.587		-.980	.328		
	Perceived persuader legitimacy	.199	.089	.124	2.231	.027	.587	1.703
	Perceived urgency	.481	.114	.237	4.226	.000	.574	1.741
	Perceived consequences	-.064	.105	-.034	-.614	.540	.593	1.687
	Subjective norm	.218	.068	.176	3.196	.002	.594	1.684
	Perceived behavioral control	.477	.068	.344	7.006	.000	.751	1.331
	Perceived self interest	.061	.104	.033	.586	.558	.570	1.754
	Age	-.131	.113	-.111	-1.168	.244	.200	5.003
	Work Experience	.136	.098	.130	1.384	.168	.204	4.895
	Education	.045	.093	.023	.483	.629	.777	1.287
	Gender	-.461	.176	-.122	-2.620	.009	.838	1.193
	Position	.065	.114	.029	.566	.572	.703	1.423

a. Dependent Variable: Behavior

Table VIII - 40: The Variance Inflation Factors (VIF) and Regression Coefficients

8.3.1.4 Dependent Variable: Diffusion Rate

A regression analysis was run to determine whether the rate by which sustainable computing is diffused among employees of UK businesses is influenced by the following variables:

- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Knowledge
- Interaction Between Knowledge and Perceived Argument Quality
- Interaction Between Knowledge and Perceived Source Credibility

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 41. The variance inflation factors (VIF) values are presented in Table VIII 42.

The adjusted R squared is 0.448 (Table VIII 41). Therefore, the variation in diffusion rate is 45% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 42. By inspecting this Table, we conclude that the following variables have a significant influence on the diffusion rate of sustainable computing:

- Perceived Relative Advantage ($B=0.754$, $t=3.753$, $p<0.01$).
- Perceived Compatibility ($B=0.475$, $t=2.898$, $p=0.004$).
- Trialability ($B=0.283$, $t=2.178$, $p=0.030$).
- Perceived Behavioural Control ($B=0.373$, $t=3.292$, $p=0.001$).
- Perceived Persuader Legitimacy ($B=-0.282$, $t=-2.259$, $p=0.025$). The relationship is negative: one unit increase in the perceived persuader legitimacy leads to 0.282 units decrease in diffusion rate, on average.

The other variables and interactions do not have a significant influence on diffusion rate of sustainable computing ($p>0.05$).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.693[a]	.481	.448	1.729	1.813

a. Predictors: (Constant), Knowledge by perceived source credibility, Perceived self interest, Perceived complexity, Trialability, Communicability, Subjective norm, Perceived risk, Perceived consequences, Perceived urgency, Perceived persuader legitimacy, Knowledge by perceived argument quality, Perceived behavioral control, Observability, Knowledge, Perceived compatibility, Perceived relative advantage

b. Dependent Variable: When did you start using double-sided printing?

Table VIII - 41: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1.050	1.050		-1.000	.318		
	Perceived relative advantage	.754	.201	.275	3.753	.000	.379	2.640
	Perceived compatibility	.475	.164	.210	2.898	.004	.387	2.585
	Perceived complexity	-.066	.130	-.032	-.507	.612	.510	1.961
	Perceived risk	-.095	.128	-.046	-.741	.459	.529	1.889
	Observability	-.132	.154	-.058	-.862	.389	.451	2.220
	Communicability	.071	.149	.029	.474	.636	.554	1.805
	Trialability	.283	.130	.113	2.178	.030	.762	1.313
	Subjective norm	.186	.097	.119	1.925	.055	.533	1.877
	Perceived behavioral control	.373	.113	.215	3.292	.001	.476	2.101
	Perceived self interest	-.222	.141	-.098	-1.574	.117	.529	1.889
	Perceived persuader legitimacy	-.282	.125	-.143	-2.259	.025	.511	1.956
	Perceived urgency	.027	.157	.010	.169	.866	.536	1.865
	Perceived consequences	.155	.137	.066	1.131	.259	.599	1.671
	Knowledge	.039	.142	.018	.274	.784	.459	2.179
	Knowledge by perceived argument quality	.010	.145	.004	.067	.946	.512	1.952
	Knowledge by perceived source credibility	.030	.161	.011	.189	.850	.582	1.719

a. Dependent Variable: When did you start using double-sided printing?

Table VIII - 42: The Variance Inflation Factors (VIF) and Regression Coefficients

8.3.1.5 Independent Variable: Innovative Behaviour

A series of regression analyses were performed to find out whether the innovative behaviour of employees influences the following variables:

- Attitude
- Intention
- Behaviour
- Diffusion Rate

The results of the analyses are summarized in Table VIII 43 below:

Relationship	Adjusted R square	B	p
Innovative Behaviour → Attitude	0.146	0.375	<0.001
Innovative Behaviour → Intention	0.201	0.664	<0.001
Innovative Behaviour → Behaviour	0.192	0.669	<0.001
Innovative Behaviour → Diffusion Rate	0.404	1.176	<0.001

Table VIII - 43: Regression Analysis

The innovative behaviour has a significant, positive impact on attitude ($p<=0.001$): one unit increase in the innovative behaviour determines 0.375 units increase in attitude. Furthermore, the innovative behaviour accounts for 14.6% of the variation in attitude.

The innovative behaviour has a significant, positive impact on intention ($p<0.001$): one unit increase in the innovative behaviour determines 0.664 units increase in intention. Furthermore, the innovative behaviour accounts for 20.1% of the variation in intention.

The innovative behaviour has a significant, positive impact on behaviour ($p<0.001$): one unit increase in the innovative behaviour determines 0.669 units increase in behaviour. Furthermore, the innovative behaviour accounts for 19.2% of the variation in behaviour.

The innovative behaviour has a significant, positive impact on the diffusion rate ($p<0.001$): one unit increase in innovative behaviour determines 1.176 units increase in the diffusion rate. Furthermore, innovative behaviour accounts for 40.4% of the variation in the diffusion rate.

* * *

A binary logistic regression analysis was run to determine whether the innovative behaviour influences adoption (i.e. an employee's willingness to decide in favour of engaging in sustainable computing behaviour). The dependent variable is coded with 1 (adoption) and 0 (rejection), the reference category being 1. Therefore, the regression model will estimate the chances of adoption depending on the values of the independent variable. As for the independent variable, it is an ordinal variable, so its reference values will be the lower values

(the model will evaluate the chance of adoption for subjects with higher values compared with the subjects with lower values of innovative behaviour).

The goodness-of-fit indicators of the model are presented in Table VIII 44 and Table VIII 45. The Hosmer-Lemeshow test (Table VIII 44) is not statistically significant: $\chi^2(3)=4.356$, $p=0.226$. In consequence, our model fits the data well (the innovative behaviour satisfactorily explains the dependent variable adoption). The Nagelkerke pseudo R square value (Table VIII 45) is 0.299; therefore, about 30% of the variation in the dependent variable is explained by the independent variable.

The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 46. The innovative behaviour has a significant influence on the adoption: B=0.966, Exp(B)=2.627, $p<0.001$. The relationship is positive: subjects with high innovative behaviour levels have about 262% more chances to adopt the sustainable computing compared to the subjects with low innovative behaviour levels.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	4.356	3	.226

Table VIII - 44: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	262.183[a]	.209	.299

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table VIII - 45: The Nagelkerke Pseudo R Square Value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	ib	.966	.140	47.934	1	.000	2.627	1.999	3.453
	Constant	-1.922	.409	22.069	1	.000	.146		

a. Variable(s) entered on step 1: ib.

Table VIII - 46: The Regression Coefficients (B) and Antilogarithms

8.3.2 Logistic Regression Analysis

8.3.2.1 Dependent Variable: Adoption

A binomial logistic regression analysis was run to determine whether the adoption of sustainable computing is influenced by the following independent variables:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Age
- Work Experience
- Education
- Gender
- Position

The goodness-of-fit indicators of the model are presented in Table VIII 47 and Table VIII 48. The Hosmer-Lemeshow test (Table VIII 47) is not statistically significant: $\chi^2(8)=8.137$, $p=0.420$. Thus, our model fits the data well (the independent variables satisfactorily predict adoption). The Nagelkerke pseudo R square value (Table VIII 48) is 0.685; therefore, about 68% of the variation in the dependent variable is explained by the independent variables). The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 49.

The following variables have a significant influence on the adoption ($p<0.05$):

- Subjective Norm ($B=0.727$, $Exp(B)=2.069$, $p<0.01$).
- Perceived Behavioural Control ($B=1.180$, $Exp(B)=3.256$, $p<0.01$).
- Gender ($B=1.135$, $Exp(B)=3.111$, $p<0.01$). Male subjects have 311% more chances to adopt the sustainable computing compared to the female subjects.

For the following variables, the influence on the adoption is close to significance ($p<0.10$):

- Perceived Urgency ($B=0.562$, $Exp(B)=1.754$, $p=0.056$).
- Perceived Consequences ($B=0.550$, $Exp(B)=1.733$, $p=0.067$).
- Perceived Self Interest ($B=0.498$, $Exp(B)=1.645$, $p=0.088$).
- Age ($B=-0.509$, $Exp(B)=0.601$, $p=0.078$). The relationship is negative: older subjects have 40% less chances (on average) to adopt the sustainable computing compared to the younger subjects.

The other variables do not have a significant influence on the adoption ($p>0.10$).

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	8.137	8	.420

Table VIII - 47: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	148.857[a]	.479	.685

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table VIII - 48: The Nagelkerke Pseudo R Square Value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	percpersleg	-.284	.249	1.296	1	.255	.753	.462	1.227
	percurg	.562	.294	3.642	1	.056	1.754	.985	3.122
	perconseq	.550	.300	3.349	1	.067	1.733	.962	3.122
	subnorm	.727	.185	15.519	1	.000	2.069	1.441	2.972
	percbehc	1.180	.237	24.712	1	.000	3.256	2.044	5.186
	perselfint	.498	.291	2.917	1	.088	1.645	.929	2.912
	age	-.509	.288	3.109	1	.078	.601	.342	1.058
	workexp	.410	.255	2.594	1	.107	1.507	.915	2.482
	educ	-.002	.231	.000	1	.995	.998	.635	1.569
	gender(1)	1.135	.455	6.216	1	.013	3.111	1.275	7.591
	position	.382	.277	1.909	1	.167	1.466	.852	2.520
	Constant	-13.229	2.214	35.712	1	.000	.000		

a. Variable(s) entered on step 1: percpersleg, percurg, perconseq, subnorm, percbehc, perselfint, age, workexp, educ, gender, position.

Table VIII - 49: The Regression Coefficients and Antilogarithms

8.3.2.2 Dependent Variable: Continued Adoption

A binomial logistic regression analysis was run to determine whether the continued adoption of sustainable computing is influenced by the following independent variables:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Age
- Work Experience
- Education
- Gender
- Position

The goodness-of-fit indicators of the model are presented in Table VIII 50 and Table VIII 51. The Hosmer-Lemeshow test (Table VIII 50) is not statistically significant: $\chi^2(8)=2.643$, p=0.955. In consequence, our model fits the data well (the independent variables satisfactorily explain the dependent variable adoption). The Nagelkerke pseudo R square value (Table VIII 51) is 0.569; therefore, about 60% of the variation in the dependent variable is explained by the independent variables). The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 52. The following variables have a significant influence on continued adoption:

- Perceived Urgency (B=2.646, Exp(B)=14.095, p=0.001).
- Gender (B=2.093, Exp(B)=8.109, p=0.013). Male subjects have 810% times more chances to adopt the sustainable computing compared to the female subjects.
- Position (B=1.250, Exp(B)=3.490, p=0.040). Subjects with top positions (managers) have 349% more chances to adopt the sustainable computing compared to the subjects with lowest positions (employees).

The other variables do not have a significant influence on the continued adoption (p>0.05).

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	2.643	8	.955

Table VIII - 50: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	56.139[a]	.239	.569

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

Table VIII - 51: The Nagelkerke Pseudo R Square Value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	percpersleg	.116	.375	.096	1	.756	1.123	.539	2.342
	percurg	2.646	.769	11.844	1	.001	14.095	3.124	63.600
	perconseq	.380	.564	.453	1	.501	1.462	.484	4.421
	age	-.947	.581	2.657	1	.103	.388	.124	1.211
	workexp	.589	.485	1.472	1	.225	1.802	.696	4.664
	educ	.524	.490	1.143	1	.285	1.688	.646	4.410
	gender(1)	2.093	.840	6.208	1	.013	8.109	1.563	42.075
	position	1.250	.610	4.205	1	.040	3.490	1.057	11.529
	Constant	-10.098	3.657	7.625	1	.006	.000		

a. Variable(s) entered on step 1: percpersleg, percurg, perconseq, age, workexp, educ, gender, position.

Table VIII - 52: The Regression Coefficients and Antilogarithms

8.3.2.3 Dependent Variable: Later Adoption

A binomial logistic regression analysis was run to determine whether the later adoption of sustainable computing is influenced by the following independent variables:

- Observability
- Age
- Work Experience
- Education
- Gender
- Position

The goodness-of-fit indicators of the model are presented in Table VIII 53 and Table VIII 54. The Hosmer-Lemeshow test (Table VIII 53) is not statistically significant: $\chi^2(8)=9.609$, $p=0.294$. In consequence, our model fits the data well. The Nagelkerke pseudo R square value (Table VIII 54) is 0.377; therefore, about 37% of the variation in the dependent variable is explained by the independent variables). The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 55.

The following variables have a significant influence on the later adoption ($p<0.05$):

- Education ($B=-0.674$, $Exp(B)=0.509$, $p=0.035$). The relationship is negative: subjects with higher education have 50% less chances to later adopt the sustainable computing compared to the subjects with lower education.

For the following variables, the influence on later adoption is close to significance ($p<0.10$):

- Work Experience ($B=-0.718$, $Exp(B)=0.488$, $p=0.065$). The relationship is negative: subjects with higher work experience have 52% less chances to later adopt the sustainable computing compared to the subjects with lower work experience.

The other variables do not have a significant influence on the later adoption ($p>0.10$).

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	9.609	8	.294

Table VIII - 53: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	74.446[a]	.264	.377

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table VIII - 54: The Nagelkerke pseudo R square value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	observ	1.295	.376	11.837	1	.001	3.652	1.746	7.637
	age	.533	.402	1.759	1	.185	1.705	.775	3.751
	workexp	-.718	.389	3.406	1	.065	.488	.228	1.046
	educ	-.674	.319	4.466	1	.035	.509	.273	.952
	gender(1)	1.081	.683	2.504	1	.114	2.948	.773	11.253
	position	.085	.432	.038	1	.845	1.088	.466	2.540
	Constant	.720	1.260	.326	1	.568	2.054		

a. Variable(s) entered on step 1: observ, age, workexp, educ, gender, position.

Table VIII - 55: The Regression Coefficients and Antilogarithms

8.3.3 Analysis of Mediation Effects

8.3.3.1 Dependent Variable: Intention and Mediator: Attitude

This section presents the analysis of mediation effects of the variable attitude between the following independent variables and intention, as a dependent variable:

- Knowledge
- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 56 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Knowledge → Attitude → Intention	0.063	6.838	<0.001	0.741	0.307	58%
Perceived Relative Advantage → Attitude → Intention	0.093	6.310	<0.001	1.477	0.980	33%
Perceived Compatibility → Attitude → Intention	0.077	7.148	<0.001	1.116	0.563	49%
Perceived Complexity → Attitude → Intention	0.058	-7.584	<0.001	-0.593	-0.148	75%
Perceived Risk → Attitude → Intention	0.060	-4.675	<0.001	-0.633	-0.344	45%
Observability → Attitude → Intention	0.060	7.609	<0.001	0.900	0.375	58%
Communicability → Attitude → Intention	0.071	6.462	<0.001	0.839	0.379	54%
Trialability → Attitude → Intention	0.083	6.196	<0.001	0.481	-0.039	108%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 56: Mediation Effect Dependent Variable: Intention and Mediator: Attitude

All the mediation effects are statistically significant (p<0.001). The proportion due to mediation for the path Trialability → Attitude → Intention indicates that there is no direct relationship between trialability and intention (the intention is totally explained by the attitude). The relationship between attitude and intention is slightly negative.

The strongest mediation effect appears between perceived complexity and intention (75% of the total effect). The following relationships are negative:

- Perceived Complexity – Intention
- Perceived Risk – Intention

The other relationships are positive.

8.3.3.2 Dependent Variable: Adoption and Mediator: Intention

This section presents the analysis of mediation effects of the variable intention between the following independent variables and adoption, as a dependent variable:

- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 57 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Subjective Norm → Intention → Adoption	0.056	6.147	<0.001	0.984	0.510	48%
Perceived Behavioural Control → Intention → Adoption	0.052	5.854	<0.001	1.285	0.993	22%
Perceived Self Interest → Intention → Adoption	0.092	3.500	<0.001	1.030	0.379	63%

c is the regression coefficient of the direct relationship between the independent and the dependent variable
c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator
The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 57: Dependent Variable: Adoption and Mediator: Intention

All the mediation effects are statistically significant (p<0.001). The strongest mediation effect appears between perceived self interest and adoption (63% of the total effect). All the relationships between variables are positive.

8.3.3.3 Dependent Variable: Behaviour and Mediator: Intention

This section presents the analysis of mediation effects of the variable intention between the following independent variables and behaviour, as a dependent variable:

- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 58 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Subjective norm → Intention → Behaviour	0.056	10.836	<0.001	0.637	0.025	96%
Perceived behavioural control → Intention → Behaviour	0.057	9.649	<0.001	0.797	0.248	68%
Perceived self interest → Intention → Behaviour	0.086	7.322	<0.001	0.673	0.016	97%

c is the regression coefficient of the direct relationship between the independent and the dependent variable
c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator
The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 58: Dependent Variable: Behaviour and Mediator: Intention

All the mediation effects are statistically significant ($p<0.01$). Very strong mediation effects appear between perceived self interest and behaviour, on the one hand (82.1% of the total effect) and subjective norm and behaviour, on the other hand (75% of the total effect). All the relationships between variables are positive.

8.3.3.4 Dependent Variable: Continued Adoption and Mediator: Behaviour

This section presents the analysis of mediation effects of the variable behaviour between the following independent variables and adoption, as a dependent variable:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 59 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Perceived persuader legitimacy → Behaviour → Continued adoption	0.082	4.342	<0.001	0.679	-0.103	115%
Perceived urgency → Behaviour → Continued adoption	0.059	3.876	<0.001	2.123	1.475	30%
Perceived consequences → Behaviour → Continued adoption	0.059	4.003	<0.001	1.295	1.078	16%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 59: Dependent Variable: Continued Adoption and Mediator: Behaviour

All the mediation effects are statistically significant ($p<0.05$). The proportion due to mediation for the path Perceived persuader legitimacy → Behaviour → Continued adoption indicates that there is no direct relationship between perceived persuader legitimacy and continued adoption (the continued adoption is totally explained by the variable behaviour). The relationship between behaviour and continued adoption is negative. The strongest mediation effect appears between perceived urgency and continued adoption (30% of the total effect).

8.3.3.5 Dependent Variable: Later adoption and Mediators: Attitude, Intention

This section presents the analysis of mediation effects of the variables attitude and intention between observability as an independent variable and later adoption, as a dependent variable. In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 60 below:

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Observability → Attitude → Later adoption	0.055	3.154	<0.001	0.984	0.213	78%
Observability → Intention → Later adoption	0.068	4.398	<0.001	0.984	0.262	73%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 60: Dependent Variable: Later adoption and Mediators: Attitude, Intention

All the mediation effects are statistically significant ($p<0.05$).

Both mediation effects are very strong (78% and 73% of the total effect), suggesting that the later adoption is mostly influenced by attitude and intention.

8.3.4 Structural Equation Modelling

In addition to testing the research hypotheses, this study sought to validate the structural architecture of the proposed 'sustainability diffusion model'. This was done in three sequential steps. In the first step, the structure of Ajzen's Theory of Planned Behaviour was modelled. In the second step, the structure of Rogers' (1983) Innovation-Decision Process Model was modelled. Lastly, the proposed model which combines and expands both Ajzen's theory and Rogers' model was modelled.

8.3.4.1 Structural Model #1

A structural equation model was built in order to verify the relationships between the following latent constructs:

- Attitude Towards Behaviour
- Subjective Norm
- Perceived Behavioural Control
- Intention
- Behaviour

The model is presented Figure VIII 14 and Figure VIII 15. In order to estimate the model's parameters, the maximum likelihood method was employed.

Figure VIII - 14: Ajzen's (1991) Theory of Planned Behaviour

The goodness-of-fit statistics are presented in Table VIII 61.

χ^2/df	CFI	NFI	IFI	TLI	RMSEA	SRMR
4.106	0.944	0.928	0.944	0.923	0.104	0.057

Table VIII - 61: Goodness-Of-Fit Statistics

Most indicators above fall within the cutoff values; the only exception is RMSEA, which is higher than 0.08. In consequence, this model can be regarded as acceptable.

The path weights for the measurement model are presented in Table VIII 62.

Path	B	Beta	p
a1 ← Attitude	1	0.819	-
a2 ← Attitude	0.836	0.787	<0.01
a3 ← Attitude	1.352	0.920	<0.01
sn1 ← Subjective Norm	1	0.741	-
sn2 ← Subjective Norm	1.118	0.878	<0.01
sn3 ← Subjective Norm	1.181	0.950	<0.01
pbc1 ← Perceived Behavioural Control	1	0.814	-
pbc2 ← Perceived Behavioural Control	0.945	0.851	<0.01
pbc3 ← Perceived Behavioural Control	0.689	0.683	<0.01
i1 ← Intention	1	0.965	-
i2 ← Intention	0.944	0.951	<0.01
b1 ← Behaviour	1	0.955	-
b2 ← Behaviour	0.842	0.852	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 62: Path Weights

All the weights are statistically significant ($p<0.01$) and all the standardized weights are greater than 0.500. In conclusion, the individual items are well explained by their underlying factors. The regression coefficients for the structural (causal) model are shown in Table VIII 63.

Path	B	Beta	p
Intention ← Attitude	0.792	0.458	<0.01
Intention ← Subjective Norm	0.380	0.271	<0.01
Intention ← Perceived Behavioural Control	0.243	0.127	<0.01
Behaviour ← Intention	0.781	0.739	<0.01
Behaviour ← Perceived Behavioural Control	0.328	0.238	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 63: Regression Coefficients

All the regression coefficients are statistically significant ($p<0.01$), so all the hypotheses concerning the relationships between the latent constructs are supported. Furthermore, all the relationships are positive. By inspection of Table VIII 63 we reach to the following conclusions:

- One unit increase in attitude leads to 0.792 units increase in intention.
- One unit increase in subjective norm leads to 0.380 units increase in intention.
- One unit increase in behavioural control leads to 0.243 units increase in intention.
- One unit increase in intention leads to 0.781 units increase in behaviour.
- One unit increase in behavioural control leads to 0.328 units increase in behaviour.

The average variance explained (AVE) and the composite reliability (CR) for the latent variables attitude, intention and behaviour are shown in Table VIII 64.

	AVE	CR
Attitude	0.711	0.809
Intention	0.767	0.865
Behaviour	0.551	0.701

Table VIII - 64: Average Variance Explained (AVE) and Composite Reliability (CR)

All the average variance extracted are higher than 0.50. Besides, all the composites reliabilities are higher than 0.70, indicating a good internal consistency of the latent factors. In order to assess the discriminant validity, we have compared the average variance extracted with the squared correlations between constructs. The figures are summarized in Table VIII 65.

	Attitude	Intention	Behaviour
Attitude	**0.711**		
Intention	0.543	**0.767**	
Behaviour	0.516	0.780	**0.551**

Table VIII - 65: Internal Consistency Analysis

There is a problem of discriminant validity concerning the variables intention and behaviour: for these constructs, the average variance extracted is lower than the squared correlation. The means, standard deviations and standard error means of the latent variables attitude, intention and behaviour can be found in Table VIII 66.

Model 1	Mean	SD	SE
Attitude	0.02	1.07	0.063
Intention	-0.05	1.84	0.108
Behaviour	0.06	1.85	0.115

Table VIII - 66: Discriminant Validity Analysis

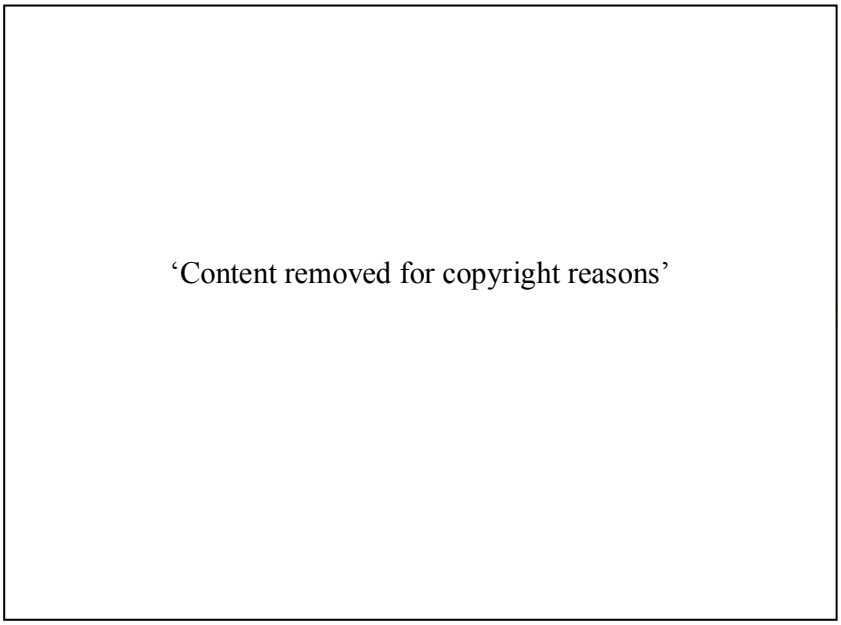


Figure VIII - 15: Structural Equation Modelling of Ajzen's (1991) Theory of Planned Behaviour

8.3.4.2 Structural Model #2

A structural equation model was built in order to verify the relationships between the following latent constructs:

- Knowledge
- Attitude Towards Behaviour
- Intention
- Behaviour
- Confirmation

The model is shown in Figure VIII 16 and Figure VIII 17. To estimate the model parameters, the maximum likelihood method was employed. The goodness-of-fit statistics are presented in Table VIII 67.

χ^2/df	CFI	NFI	IFI	TLI	RMSEA	SRMR
3.672	0.902	0.871	0.903	0.879	0.097	0.074

Table VIII - 67: goodness-of-fit statistics

Only four goodness-of-fit indicators meet the cutoff values: χ^2/df, CFI, IFI and SRMR. Therefore, the model is not very consistent.

The path weights for the measurement model are presented in Table VIII 68.

Path	B	Beta	p
a1 ← Attitude	1	0.838	-
a2 ← Attitude	0.830	0.799	<0.01
a3 ← Attitude	1.295	0.901	<0.01
k1 ← Knowledge	1	0.926	-
k2 ← Knowledge	1.075	0.929	<0.01
pc1 ← Perceived Compatibility	1	0.914	-
pc2 ← Perceived Compatibility	0.903	0.878	<0.01
pc3 ← Perceived Compatibility	0.627	0.715	<0.01
i1 ← Intention	1	0.960	-
i2 ← Intention	0.948	0.950	<0.01
b1 ← Behaviour	1	0.958	-
b2 ← Behaviour	0.842	0.854	<0.01
conf1 ← Confirmation	1	0.953	-
conf2 ← Confirmation	0.805	0.774	<0.01
pcx1 ← Perceived Complexity	1	0.849	-
pcx2 ← Perceived Complexity	1.038	0.946	<0.01
pra1 ← Perceived Relative Advantage	1	0.862	-
pra2 ← Perceived Relative Advantage	0.785	0.683	<0.01
pra3 ← Perceived Relative Advantage	1.139	0.838	<0.01

o1 ← Observability	1	0.819	-
o2 ← Observability	0.833	0.723	<0.01
t1 ← Trialability	1	0.625	-
t2 ← Trialability	1.582	0.767	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 68: Path Weights

All the weights are statistically significant ($p<0.01$) and all the standardized weights are greater than 0.500. In conclusion, the individual items are well explained by their underlying factors. The coefficients for the structural (causal) model are shown in Table VIII 69.

Path	B	Beta	p
Attitude ← Knowledge	-0.044	-0.041	0.486
Attitude ← Perceived Complexity	-0.028	-0.026	0.614
Attitude ← Perceived Compatibility	0.141	0.151	0.136
Attitude ← Perceived Relative Advantage	0.992	0.754	<0.01
Attitude ← Observability	-0.097	-0.086	0.371
Attitude ← Trialability	0.289	0.153	0.015
Intention ← Attitude	0.173	0.103	0.361
Intention ← Perceived Relative Advantage	1.667	0.754	<0.01
Behaviour ← Intention	0.947	0.889	<0.01
Confirmation ← Behaviour	0.970	0.935	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 69: Regression Coefficients

By visual inspection of Table VIII 69, one can draw the following conclusions:

- The perceived relative advantage has a significant, positive impact on the attitude (one unit increase in perceived relative advantage leads to 0.992 units increase in attitude).
- The trialability has a significant, positive impact on the attitude (one unit increase in trialability leads to 0.289 units decrease in attitude).
- The perceived relative advantage has a significant, positive impact on the intention (one unit increase in perceived relative advantage leads to 1.667 units increase in intention).
- The intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 0.947 units increase in behaviour).
- The behaviour has a significant, positive impact on the confirmation (one unit increase in behaviour leads to 0.978 units increase in confirmation).

The relationships between the other latent constructs are not statistically significant ($p>0.05$).

The average variance explained (AVE) and the composite reliability (CR) for the latent variables attitude, intention and behaviour can be seen in Table VIII 70.

	AVE	**CR**
Attitude	0.700	0.817
Intention	0.755	0.855
Behaviour	0.558	0.708

Table VIII - 70: Average Variance Explained (AVE) and Composite Reliability (CR)

All the average variance extracted are higher than 0.50. Moreover, all the composites reliabilities are higher than 0.70, indicating a good internal consistency of the latent factors. In order to assess the discriminant validity, we have compared the average variance extracted with the squared correlations between constructs. The figures are in Table VIII 71.

	Attitude	Intention	Behaviour
Attitude	**0.711**		
Intention	0.566	**0.755**	
Behaviour	0.503	0.794	**0.558**

Table VIII - 71: Discriminant Validity

There is a small problem of discriminant validity concerning the variables intention and behaviour: for these constructs, the average variance extracted is lower than the squared correlation. The means, standard deviations and standard error means of the latent variables attitude, intention and behaviour can be found in Table VIII 72.

Model 1	**Mean**	**SD**	**SE**
Attitude	-0.02	1.07	0.06
Intention	0.01	1.86	0.11
Behaviour	0.01	1.94	0.12

Table VIII - 72: Means, Standard Deviations and Standard Error Means

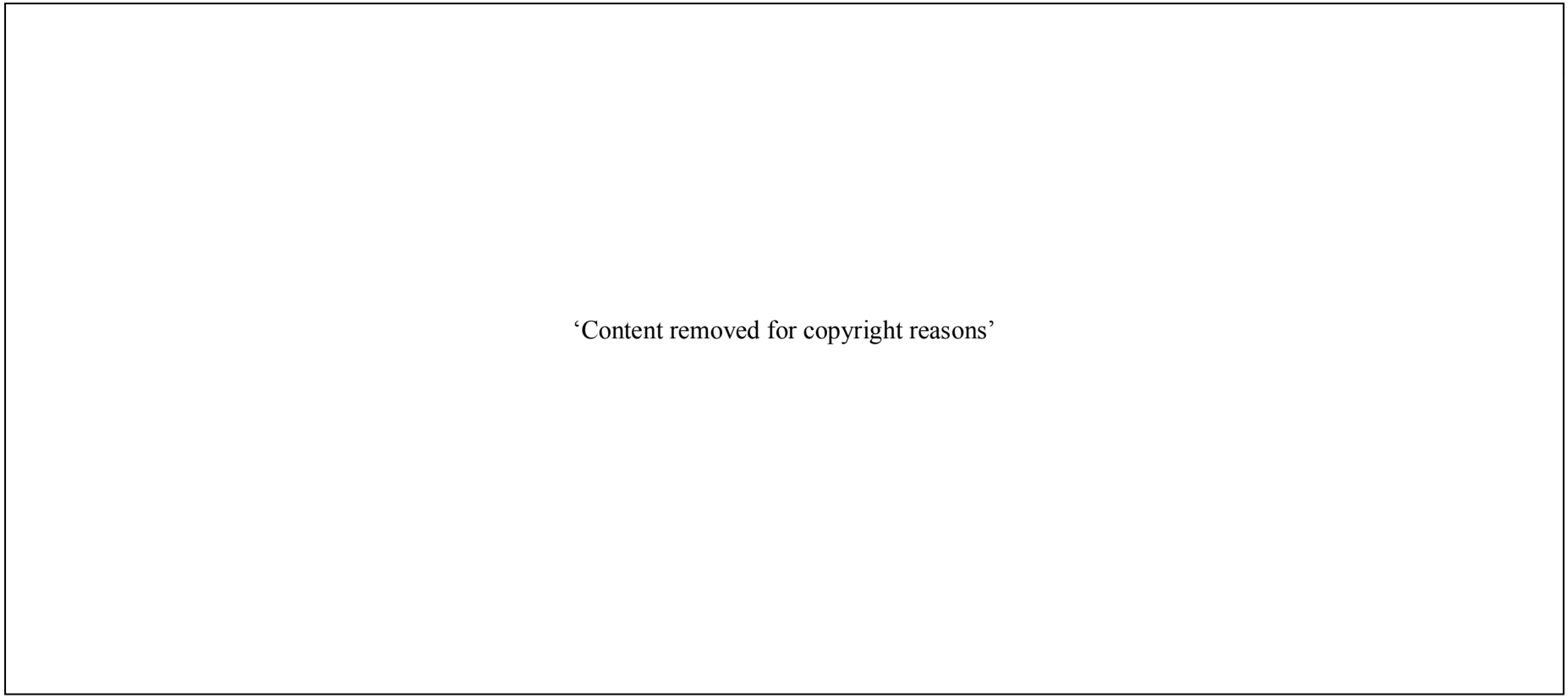


Figure VIII - 16: Rogers' (1983) Innovation-Decision Process Model

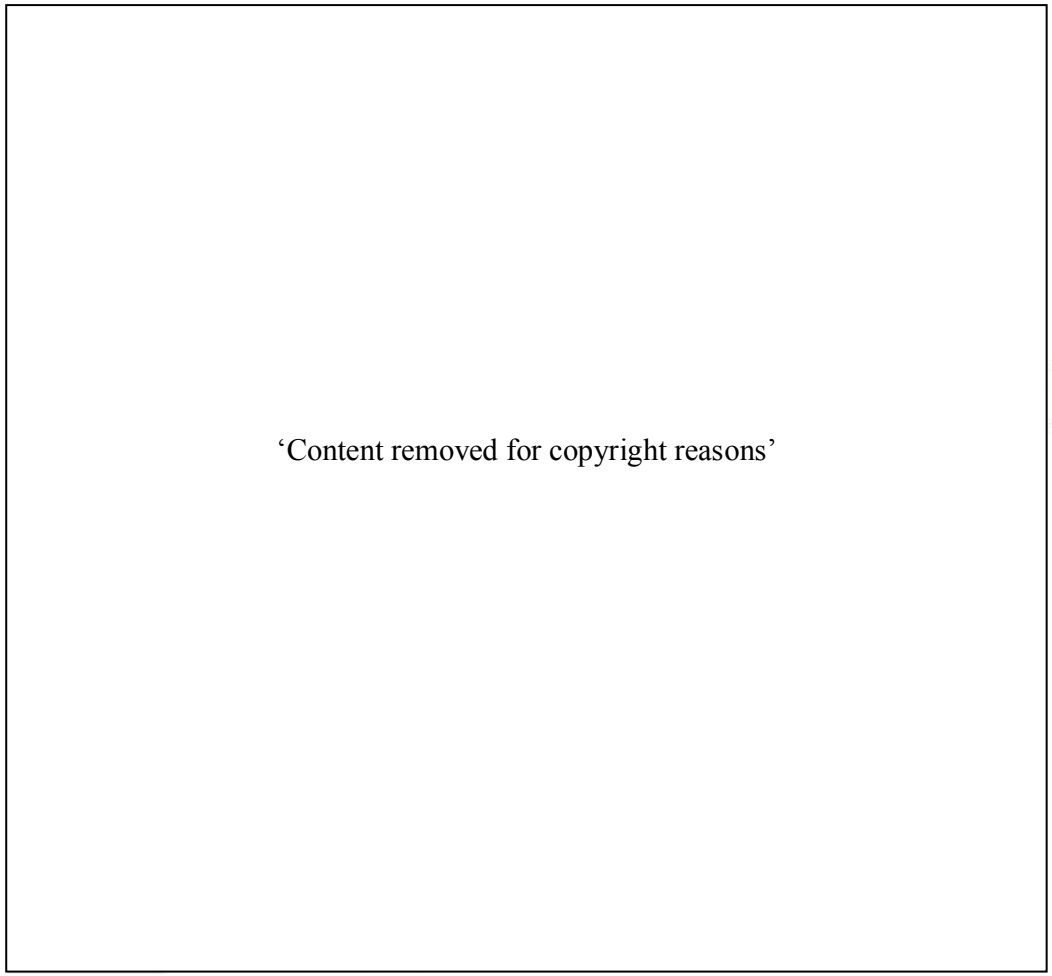


Figure VIII - 17: Structural Equation Modelling of Rogers' (1983) Innovation-Decision Process Model

8.3.4.3 Structural Model #3

A structural equation model was built in order to verify the relationships between the following latent constructs:

- Knowledge
- Attitude Towards Behaviour
- Intention
- Behaviour
- Confirmation

The IBM SPSS Amos software, version 21, was used. The model is VIII 18. To estimate the model parameters, the maximum likelihood method was employed. The goodness-of-fit statistics are presented in Table VIII 73.

χ^2/df	CFI	NFI	IFI	TLI	RMSEA	SRMR
3.073	0.836	0.777	0.838	0.810	0.085	0.092

Table VIII - 73: Goodness-Of-Fit Statistics

Only one goodness-of-fit indicator meets the cutoff value (χ^2/df). The path weights for the measurement model are presented in Table VIII 74.

Path	**B**	**Beta**	**P**
a1 ← Attitude	1	0.843	-
a2 ← Attitude	0.827	0.801	<0.01
a3 ← Attitude	1.278	0.895	<0.01
k1 ← Knowledge	1	0.919	-
k2 ← Knowledge	1.068	0.917	<0.01
pc1 ← Perceived Compatibility	1	0.912	-
pc2 ← Perceived Compatibility	0.911	0.883	<0.01
pc3 ← Perceived Compatibility	0.621	0.707	<0.01
i1 ← Intention	1	0.957	-
i2 ← Intention	0.953	0.952	<0.01
b1 ← Behaviour	1	0.955	-
b2 ← Behaviour	0.845	0.855	<0.01
conf1 ← Confirmation	1	0.948	-
conf2 ← Confirmation	0.813	0.779	<0.01
pcx1 ← Perceived Complexity	1	0.928	-
pcx2 ← Perceived Complexity	0.868	0.866	<0.01
pra1 ← Perceived Relative Advantage	1	0.833	-
pra2 ← Perceived Relative Advantage	1.144	0.654	<0.01
pra3 ← Perceived Relative Advantage	0.759	0.817	<0.01
o1 ← Observability	1	0.773	-
o2 ← Observability	0.935	0.766	<0.01

t1 ← Trialability	1	0.654	-
t2 ← Trialability	1.472	0.736	<0.01
pra1 ← Perceived Argument Quality	1	0.932	-
pra2 ← Perceived Argument Quality	1.025	0.930	<0.01
pra3 ← Perceived Argument Quality	1.060	0.833	<0.01
psc1 ← Perceived Source Credibility	1	0.893	-
psc2 ← Perceived Source Credibility	0.859	0.767	<0.01
pr1 ← Perceived Risk	1	0.840	-
pr2 ← Perceived Risk	1.200	0.897	<0.01
pr3 ← Perceived Risk	0.668	0.627	
c1 ← Communicability	1	0.866	-
c2 ← Communicability	0.980	0.844	<0.01
sn1 ← Subjective Norm	1	0.745	-
sn2 ← Subjective Norm	1.121	0.886	<0.01
sn3 ← Subjective Norm	1.162	0.940	<0.01
pbc1 ← Perceived Behavioural Control	1	0.863	-
pbc2 ← Perceived Behavioural Control	0.862	0.823	<0.01
pb3 ← Perceived Behavioural Control	0.589	0.619	<0.01
psi1 ← Perceived Self Interest	1	0.645	-
psi2 ← Perceived Self Interest	1.439	0.970	<0.01
psi3 ← Perceived Self Interest	1.410	0.629	<0.01
ppl1 ← Perceived Persuader Legitimacy	1	0.934	-
ppl2 ← Perceived Persuader Legitimacy	1.028	0.961	<0.01
pu1 ← Perceived Urgency	1	0.924	-
pu2 ← Perceived Urgency	0.674	0.720	<0.01
pcon1 ← Perceived Consequences	1	0.875	-
pcon2 ← Perceived Consequences	1.142	0.898	<0.01
pcon3 ← Perceived Consequences	1.177	0.933	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 74: Path Weights

All the weights are statistically significant ($p<0.01$) and almost all the standardized weights are greater than 0.500. In conclusion, the individual items are well explained by their underlying factors. The coefficients for the structural (causal) model are shown in Table VIII 75.

Path	B	Beta	P
Attitude ← Perceived Complexity	-0.075	-.079	0.134
Attitude ← Perceived Compatibility	0.142	.152	0.090
Attitude ← Perceived Relative Advantage	1.029	.769	<0.01
Attitude ← Observability	-0.077	-.064	0.487
Attitude ← Trialability	0.273	.148	0.016
Attitude ← Perceived Argument Quality	-0.035	-.028	0.506
Attitude ← Perceived Source Credibility	0.121	.083	0.054
Attitude ← Perceived Risk	0.154	.151	0.008

Attitude ← Communicability	-0.020	-.016	0.779
Intention ← Attitude	-0.283	-.170	0.133
Intention ← Perceived Relative Advantage	2.034	.913	<0.01
Intention ← Subjective Norm	0.272	.196	<0.01
Intention ← Perceived Behavioural Control	0.036	.029	0.666
Intention ← Perceived Self Interest	-0.129	-.053	0.247
Behaviour ← Intention	0.966	.906	<0.01
Behaviour ← Perceived Persuader Legitimacy	0.239	.138	<0.01
Behaviour ← Perceived Urgency	-0.203	-.105	0.059
Behaviour ← Perceived Consequences	-0.036	-.016	0.710
Confirmation ← Behaviour	0.975	.933	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 75: Regression Coefficients

By visual inspection of Table VIII 75, one can draw the following conclusions:

- Perceived relative advantage has a significant, positive impact on the attitude (one unit increase in perceived relative advantage leads to 1.029 units increase in attitude).
- The trialability has a significant, positive impact on the attitude (one unit increase in trialability leads to 0.273 units increase in attitude).
- The perceived risk has a significant, positive impact on the attitude (one unit increase in perceived risk leads to 0.154 units increase in attitude).
- Perceived relative advantage has a significant, positive impact on intention (one unit increase in perceived relative advantage leads to 2.034 units increase in intention).
- The subjective norm has a significant, positive impact on the intention (one unit increase in subjective norm leads to 0.272 units increase in intention).
- The intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 0.966 units increase in behaviour).
- Perceived persuader legitimacy has a significant, positive impact on behaviour (one unit increase in perceived persuader legitimacy leads to 0.239 units increase in behaviour).
- The behaviour has a significant, positive impact on the confirmation (one unit increase in behaviour leads to 0.975 units increase in confirmation).

The relationships between the other latent constructs are not statistically significant ($p>0.05$).

The average variance explained (AVE) and the composite reliability (CR) for the latent variables attitude, intention and behaviour can be seen in Table VIII 76.

	AVE	CR
Attitude	0.763	0.816
Intention	0.754	0.854
Behaviour	0.555	0.704

Table VIII - 76: Average Variance Explained (AVE) and Composite Reliability (CR)

All the average variance extracted are higher than 0.50. Moreover, all the composites reliabilities are higher than 0.70, indicating a good internal consistency of the latent factors. In order to assess the discriminant validity, we have compared the average variance extracted with the squared correlations between constructs. The figures are in Table VIII 77.

	Attitude	Intention	Behaviour
Attitude	**0.763**		
Intention	0.576	**0.754**	
Behaviour	0.511	0.803	**0.555**

Table VIII - 77: Discriminant Validity

There is a small problem of discriminant validity concerning the variables intention and behaviour: for these constructs, the average variance extracted is lower than the squared correlation. The means, standard deviations and standard error means of the latent variables attitude, intention and behaviour can be found in Table VIII 78.

Model 1	Mean	SD	SE
Attitude	-0.02	1.13	0.06
Intention	0.01	1.83	0.11
Behaviour	0.02	1.95	0.12

Table VIII - 78: Means, Standard Deviations and Standard Error Means

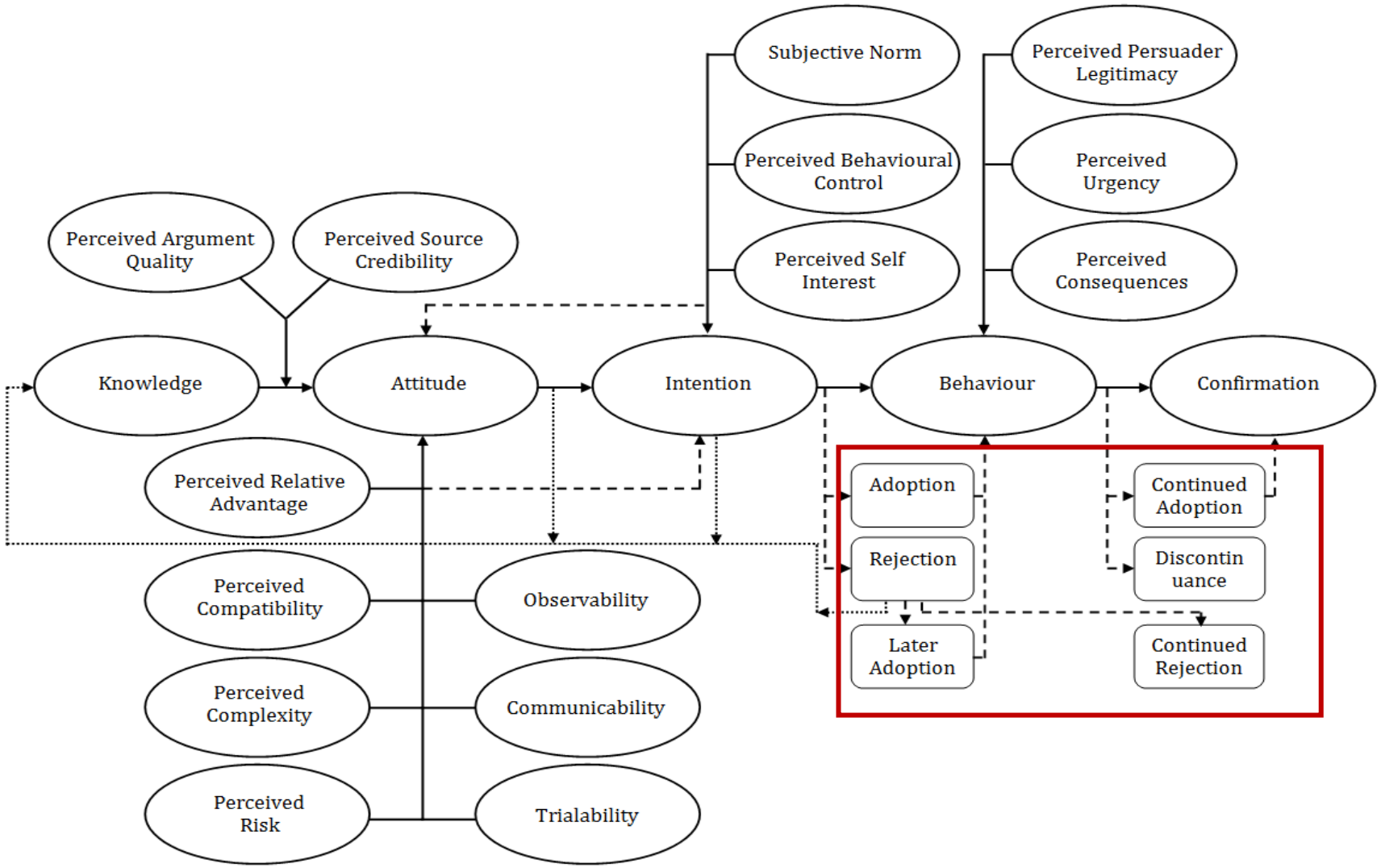


Figure VIII - 18: The Proposed Sustainability Diffusion Model

8.4 Study III: Diffusion of Sustainability Culture

The third study investigated the diffusion of sustainability culture and sought to explore the current mindset of UK universities' employees and their willingness to behave sustainably at work. There are numerous reasons which explain the author's decision to study the diffusion of sustainability culture or mindset in UK universities. Firstly, sustainability scholars tend to explore the antecedents of tangible pro-sustainability behaviours such as recycling, video conferencing and cycling to work. Studies that investigate the diffusion of sustainability as a mindset or as an organisational culture are very rare. Hence, it made perfect sense to explore a problem that has not been sufficiently explored by other sustainability scholars. Secondly, higher education institutions are on the frontlines in the struggle against climate change. Their employees are "supposedly" more familiar with the concept and principles of sustainable development than the employees of other industries or sectors. Hence, it is generally assumed that university employees express greater willingness to embrace pro-sustainability initiatives. This assumption has not yet been confirmed or disproved, conclusively. The author, therefore, saw this gap as a great research opportunity. Thirdly, studying the diffusion of sustainability as an intangible construct helped the author to find out whether the general feeling in the workplaces of British higher education institutions is in favour or against sustainability.

The data collected from the employees of UK universities was analysed statistically and was used to test the research hypotheses and to validate the structural architecture of the proposed 'sustainability diffusion model'. A total of 1,525 employees were invited to take part in the study, but only 331 participated and filled in the web-based questionnaire. The response rate was approximately 22%. The majority of the participants were 31-50 years old and the number of female participations was slightly higher than that of male respondents (*See* Figure VIII 19).

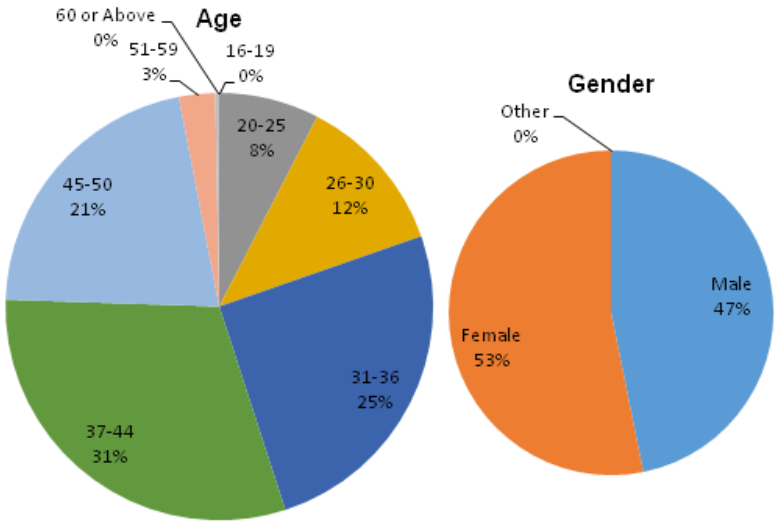


Figure VIII - 19: Age and Gender of Participants - Study III

Moreover, the majority of the participants hold PhDs and Master's degrees, 57% and 21% respectively (*See* Figure VIII 20). In terms of work experience, 23% of the respondents have over 20 years of experience and 22% have 6-10 years of experience. In terms of job positions 67% were employees; 19% were line managers; 11% were middle managers; and 3% were senior managers (*See* Figure VIII 21).

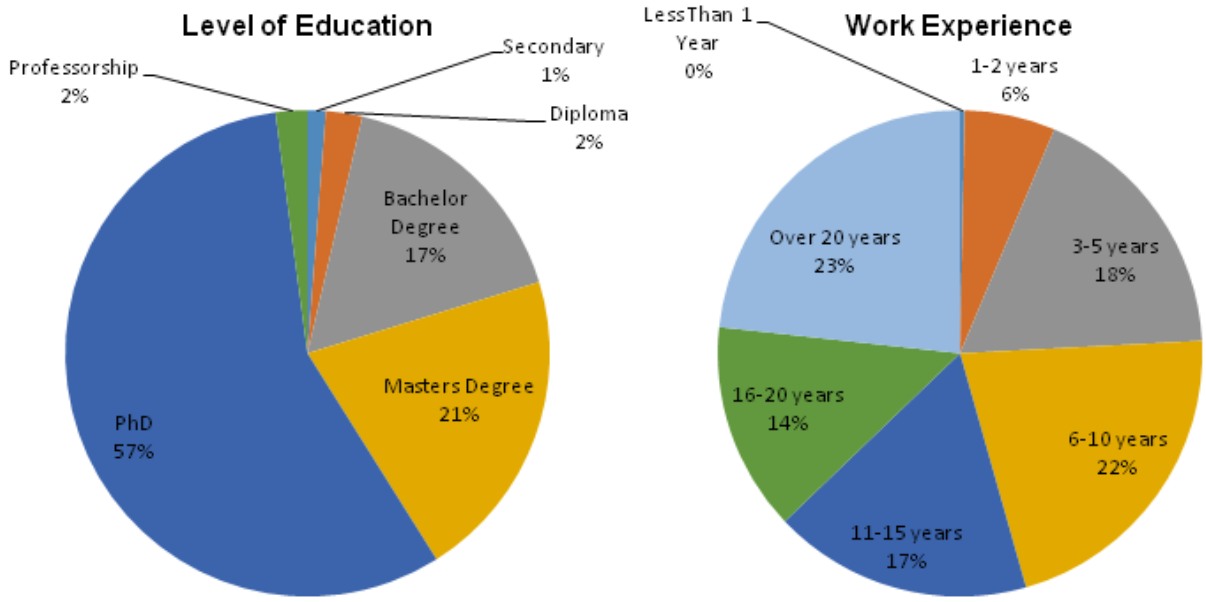


Figure VIII - 20: Education and Experience of Participants - Study III

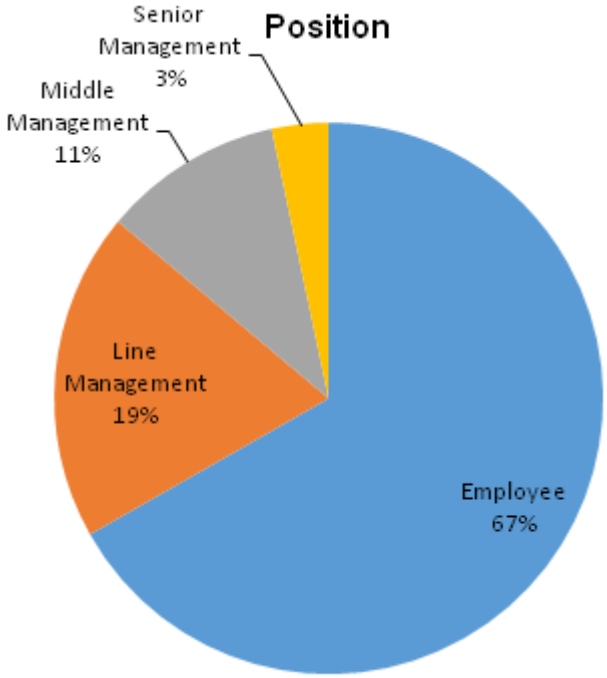


Figure VIII - 21: Job Positions of Participants - Study III

Prior to the commencement of the data analysis and interpretation process, the questionnaire's constructs' internal consistency was examined again. Internal consistency analysis is commonly used to evaluate the reliability of multi-items measures through administering the questionnaire to a sample on a single occasion (de Vaus, 2002). Cronbach's alpha is the most widely used method for evaluating the internal consistency reliability of the multi-items measure (Bryman, 2001). Cronbach's alpha represents an indicator of the average correlations between all the items combined to form the scale. A high value of Cronbach's alpha indicates more reliability of the measures.

Although, the recommended value of Cronbach's alpha coefficient of a scale is 0.7 or above (de Vaus, 2002), it should be noted that Cronbach's alpha values are sensitive to the number of items used for measuring a construct. If a scale contains a small number of items, the value of Cronbach's alpha can be quite small. In this case, items with item total correlations of less than 0.30 are recommended to be removed (Pallant, 2001). Table VIII 79 illustrates the outcomes of the internal consistency analysis and the scale reliabilities of different constructs.

Construct	**Cronbach's alpha**	**Internal consistency**
Attitude	0.898	Very good
Subjective Norm	0.798	Good
Perceived Behavioural Control	0.869	Very good
Intention	0.911	Excellent
Behaviour	0.962	Excellent
Confirmation	0.814	Very good
Perceived Relative Advantage	0.653	Acceptable
Perceived Complexity	0.868	Very good
Trialability	0.867	Very good
Perceived Compatibility	0.925	Excellent
Observability	0.851	Very good
Communicability	0.917	Excellent
Perceived Risk	0.795	Good
Perceived Source Credibility	0.872	Very good
Perceived Argument Quality	0.915	Excellent
Perceived Self Interest	0.872	Very good
Perceived Consequences	0.927	Excellent
Perceived Urgency	0.898	Very good
Perceived Persuader Legitimacy	0.936	Excellent
Knowledge	0.850	Very good

Table VIII - 79: Scale Reliabilities

8.4.1 Regression Analysis

8.4.1.1 Dependent Variable: Attitude

A regression analysis was performed to determine whether employees' attitudes towards sustainability is influenced by the following variables:

- Knowledge
- Interaction Between Knowledge and Perceived Argument Quality
- Interaction Between Knowledge and Perceived Source Credibility
- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Age
- Work Experience
- Education
- Gender
- Position

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 80. The variance inflation factors (VIF) values are presented in Table VIII 81.

The adjusted R squared is 0.534 (Table VIII 80). Therefore, the variation in attitude is 53% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 81. By inspecting this Table, we conclude that the following variables have a significant influence on attitude:

- Knowledge (B=-0.130, t=-2.099, p=0.037). The relationship is negative: one unit increase in knowledge leads to 0.130 units decrease in attitude.
- Perceived Relative Advantage (B=0.139, t=2.127, p=0.034).
- Perceived Compatibility (B=0.373, t=5.068, p<0.001).
- Perceived Risk (B=-0.214, t=-4.112, p<0.001). The relationship is negative: one unit increase in perceived risk leads to 0.214 units decrease in attitude.
- Observability (B=0.190, t=3.889, p<0.01).
- Communicability (B=0.116, t=2.051, p=0.041).
- Perceived Behavioural Control (B=0.107, t=2.142, p=0.033).

The other variables and interactions do not have a significant influence on attitude (p>0.05).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.748[a]	.559	.534	.69515	1.966

a. Predictors: (Constant), Position, Knowledge by Perceived source credibility, Perceived self interest, Gender, Trialability, Education, Subjective norm, Perceived risk, Work Experience, Communicability, Perceived relative advantage, Knowledge, Perceived complexity, Observability, Perceived behavioral control, Perceived compatibility, Knowledge by Perceived argument quality, Age

b. Dependent Variable: Attitude

Table VIII - 80: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.584	.513		5.038	.000	1.575	3.594		
	Knowledge	-.130	.062	-.105	-2.099	.037	-.251	-.008	.564	1.772
	Knowledge by Perceived argument quality	-.034	.060	-.034	-.564	.573	-.151	.084	.397	2.516
	Knowledge by Perceived source credibility	.046	.070	.037	.655	.513	-.093	.185	.444	2.252
	Perceived relative advantage	.139	.065	.102	2.127	.034	.010	.267	.616	1.624
	Perceived compatibility	.373	.074	.293	5.068	.000	.228	.518	.424	2.358
	Perceived complexity	.022	.057	.020	.384	.701	-.090	.134	.546	1.830
	Perceived risk	-.214	.052	-.182	-4.112	.000	-.316	-.112	.720	1.388
	Observability	.190	.049	.200	3.889	.000	.094	.287	.536	1.866
	Communicability	.116	.057	.094	2.051	.041	.005	.228	.676	1.479
	Trialability	-.005	.050	-.004	-.098	.922	-.103	.093	.728	1.373
	Subjective norm	.042	.035	.057	1.216	.225	-.026	.111	.646	1.549
	Perceived behavioral control	.107	.050	.118	2.142	.033	.009	.206	.462	2.166
	Perceived self interest	.027	.043	.028	.633	.527	-.057	.111	.708	1.412
	Age	.089	.063	.109	1.402	.162	-.036	.213	.233	4.293
	Work Experience	-.072	.048	-.114	-1.498	.135	-.167	.023	.246	4.070
	Education	.040	.047	.037	.857	.392	-.052	.132	.750	1.334
	Gender	-.157	.081	-.077	-1.933	.054	-.316	.003	.891	1.122
	Position	.057	.055	.045	1.038	.300	-.051	.165	.735	1.361

a. Dependent Variable: Attitude

Table VIII - 81: The Variance Inflation Factors (VIF) Values

8.4.1.2 Dependent Variable: Intention

A regression analysis was executed to find out whether employees' intention to embrace sustainability is influenced by the following variables:

- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Knowledge
- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability
- Age
- Work Experience
- Education
- Gender
- Position

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 82. The variance inflation factors (VIF) values are presented in Table VIII 8.

The adjusted R squared is 0.515 (Table VIII 82). Therefore, the variation in intention is 51% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 83. By inspecting this table we conclude that the following variables have a significant influence on the intention:

- Perceived Self Interest (B=0.110, t=2.287, p=0.023).
- Perceived Relative Advantage (B=0.254, t=3.429, p=0.001).
- Perceived Compatibility (B=0.298, t=3.559, p<0.001).
- Perceived Complexity (B=-0.144, t=-2.241, p=0.026). The relationship is negative.
- Perceived Risk (B=-0.154, t=-2.624, p=0.009). The relationship is negative.
- Observability (B=0.126, t=2.283, p=0.023).
- Communicability (B=0.133, t=2.065, p=0.040).

The other variables do not have a significant influence on intention (p>0.05).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.734[a]	.539	.515	.78987	2.014

a. Predictors: (Constant), Position, Perceived compatibility, Gender, Education, Perceived self interest, Trialability, Work Experience, Perceived risk, Subjective norm, Communicability, Knowledge, Perceived relative advantage, Perceived complexity, Observability, Perceived behavioral control, Age

b. Dependent Variable: Intention

Table VIII - 82: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.214	.569		3.892	.000	1.095	3.333		
	Subjective norm	.049	.040	.059	1.252	.212	-.028	.127	.650	1.538
	Perceived behavioral control	.016	.057	.016	.290	.772	-.095	.128	.466	2.147
	Perceived self interest	.110	.048	.103	2.287	.023	.015	.205	.717	1.394
	Knowledge	.060	.067	.043	.889	.375	-.072	.191	.619	1.615
	Perceived relative advantage	.254	.074	.167	3.429	.001	.108	.400	.616	1.623
	Perceived compatibility	.298	.084	.209	3.559	.000	.133	.462	.425	2.353
	Perceived complexity	-.144	.064	-.115	-2.241	.026	-.270	-.018	.556	1.797
	Perceived risk	-.154	.059	-.117	-2.624	.009	-.269	-.038	.734	1.363
	Observability	.126	.055	.119	2.283	.023	.017	.235	.544	1.840
	Communicability	.133	.064	.096	2.065	.040	.006	.260	.678	1.475
	Trialability	-.009	.057	-.007	-.164	.870	-.121	.102	.731	1.368
	Age	.104	.071	.115	1.457	.146	-.036	.244	.236	4.235
	Work Experience	-.085	.055	-.120	-1.556	.121	-.193	.023	.246	4.067
	Education	-.009	.053	-.007	-.166	.868	-.112	.095	.761	1.313
	Gender	.081	.091	.035	.882	.378	-.099	.260	.907	1.102
	Position	.062	.062	.045	1.007	.315	-.060	.185	.741	1.350

a. Dependent Variable: Intention

Table VIII - 83: The Variance Inflation Factors (VIF) Values

8.4.1.3 Dependent Variable: Behaviour

A regression analysis was performed to determine whether the behaviour (i.e. behaving sustainably at work) is influenced by the following variables:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Age
- Work Experience
- Education
- Gender
- Position

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 84. The variance inflation factors (VIF) values are presented in Table VIII 85.

The adjusted R squared is 0.472 (Table VIII 84). Therefore, the variation in behaviour is 47% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 85. By inspecting this table we conclude that the following variables have a significant influence on the behaviour:

- Perceived Urgency (B=0.229, t=3.255, p=0.001).
- Subjective Norm (B=0.183, t=4.083, p<0.001).
- Perceived Behavioural Control (B=0.418, t=7.562, p<0.001).
- Perceived Self Interest (B=0.174, t=2.871, p=0.004).
- Age (B=0.182, t=2.245, p=0.025).

The other variables do not have a significant influence on behaviour (p>0.05).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.699[a]	.489	.472	.90683	1.880

a. Predictors: (Constant), Position, Perceived persuader legitimacy, Gender, Education, Perceived behavioral control, Perceived consequences, Work Experience, Perceived urgency, Subjective norm, Perceived self interest, Age

b. Dependent Variable: Behavior

Table VIII - 84: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	1.037	.378		2.746	.006	.294	1.780		
	Perceived persuader legitimacy	.034	.051	.031	.662	.508	-.067	.134	.729	1.371
	Perceived urgency	.229	.070	.160	3.255	.001	.091	.368	.660	1.514
	Perceived consequences	-.090	.053	-.083	-1.699	.090	-.195	.014	.668	1.496
	Subjective norm	.183	.045	.200	4.083	.000	.095	.271	.669	1.494
	Perceived behavioral control	.418	.055	.377	7.562	.000	.309	.526	.645	1.551
	Perceived self interest	.174	.061	.148	2.871	.004	.055	.293	.600	1.668
	Age	.182	.081	.183	2.245	.025	.022	.341	.241	4.144
	Work Experience	-.100	.062	-.128	-1.600	.111	-.222	.023	.249	4.008
	Education	.070	.059	.053	1.179	.239	-.047	.186	.796	1.256
	Gender	-.091	.103	-.036	-.881	.379	-.294	.112	.939	1.065
	Position	-.053	.071	-.034	-.743	.458	-.193	.087	.744	1.344

a. Dependent Variable: Behavior

Table VIII - 85: The Variance Inflation Factors (VIF) Values

8.4.1.4 Dependent Variable: Diffusion Rate

A regression analysis was run to determine whether the diffusion rate of sustainability among the employees of UK universities is influenced by the following variables:

- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Knowledge
- Interaction Between Knowledge and Perceived Argument Quality
- Interaction Between Knowledge and Perceived Source Credibility

The results of the Durbin-Watson test for independence of errors can be found in Table VIII 86. The variance inflation factors (VIF) values are presented in Table VIII 87.

The adjusted R squared is 0.458 (Table VIII 86). Therefore, the variation in diffusion rate is 45% explained by the variation in the independent variables. The regression coefficients are presented in Table VIII 87. By inspecting this table we conclude that the following variables have a significant influence on the diffusion rate:

- Perceived Compatibility (B=0.521, t=4.092, p<0.001).
- Perceived Risk (B=-0.238, t=-2.576, p=0.010). The relationship is negative.
- Knowledge (B=0.308, t=2.783, p=0.006) and interaction between knowledge and perceived argument quality (B=-0.299, t=-2.889, p=0.004). In consequence, the influence of knowledge depends on the level of the perceived argument quality: one unit change in knowledge leads to a change in diffusion rate with (0.308-0.299 * Perceived Argument Quality) units.

The other variables and interactions do not have a significant influence on diffusion rate.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.696[a]	.484	.458	1.207	1.951

a. Predictors: (Constant), Knowledge by Perceived source credibility, Perceived consequences, Trialability, Subjective norm, Perceived risk, Perceived relative advantage, Perceived persuader legitimacy, Communicability, Perceived complexity, Perceived urgency, Perceived self interest, Knowledge, Observability, Perceived behavioral control, Perceived compatibility, Knowledge by Perceived argument quality

b. Dependent Variable: When did you start applying "sustainable thinking" at work?

Table VIII - 86: Durbin-Watson Test for Independence of Errors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.764	.822		3.364	.001	1.148	4.381		
	Perceived relative advantage	-.194	.112	-.088	-1.728	.085	-.414	.027	.631	1.584
	Perceived compatibility	.521	.127	.253	4.092	.000	.270	.771	.429	2.333
	Perceived complexity	-.036	.097	-.020	-.370	.712	-.228	.156	.565	1.769
	Perceived risk	-.238	.092	-.126	-2.576	.010	-.420	-.056	.688	1.454
	Observability	.138	.084	.090	1.655	.099	-.026	.303	.555	1.803
	Communicability	.154	.100	.077	1.530	.127	-.044	.351	.653	1.532
	Trialability	.064	.086	.035	.741	.459	-.106	.234	.737	1.357
	Subjective norm	.097	.061	.080	1.572	.117	-.024	.217	.629	1.589
	Perceived behavioral control	.156	.087	.107	1.803	.072	-.014	.327	.464	2.156
	Perceived self interest	-.028	.083	-.018	-.344	.731	-.191	.135	.569	1.758
	Perceived persuader legitimacy	-.105	.072	-.073	-1.464	.144	-.246	.036	.655	1.528
	Perceived urgency	-.006	.099	-.003	-.065	.949	-.202	.189	.586	1.706
	Perceived consequences	.001	.072	.001	.012	.990	-.141	.143	.638	1.568
	Knowledge	.308	.111	.155	2.783	.006	.090	.526	.529	1.889
	Knowledge by Perceived argument quality	-.299	.103	-.186	-2.889	.004	-.502	-.095	.398	2.511
	Knowledge by Perceived source credibility	.015	.121	.008	.127	.899	-.224	.254	.451	2.219

a. Dependent Variable: When did you start applying "sustainable thinking" at work?

Table VIII - 87: The Variance Inflation Factors (VIF) Values

8.4.1.5 Independent Variable: Innovative Behaviour

A series of regression analyses were performed to find out whether the innovative behaviour of UK universities' employees influences the following variables:

- Attitude
- Intention
- Behaviour
- Diffusion Rate

The results of the analyses are summarized in Table VIII 88 below.

Relationship	Adjusted R square	B	p
Innovative Behaviour → Attitude	0.191	0.370	<0.001
Innovative Behaviour → Intention	0.178	0.398	<0.001
Innovative Behaviour → Behaviour	0.241	0.508	<0.001
Innovative Behaviour → Diffusion Rate	0.688	1.124	<0.001

Table VIII - 88: Regression Analysis

The innovative behaviour has a significant, positive impact on attitude ($p<0.001$): one unit increase in innovative behaviour determines 0.370 units increase in attitude. Furthermore, the innovative behaviour accounts for 19% of the variation in attitude.

The innovative behaviour has a significant, positive impact on intention ($p<0.001$): one unit increase in innovative behaviour determines 0.398 units increase in intention. Furthermore, the innovative behaviour accounts for 17% of the variation in intention.

The innovative behaviour has a significant, positive impact on behaviour ($p<0.001$): one unit increase in innovative behaviour determines 0.508 units increase in behaviour. Furthermore, the innovative behaviour accounts for 24% of the variation in behaviour.

The innovative behaviour has a significant, positive impact on the diffusion rate ($p<0.001$): one unit increase in innovative behaviour determines 1.124 units increase in the diffusion rate. Furthermore, the innovative behaviour accounts for 68% of the variation in the diffusion rate.

* * *

A binary logistic regression analysis was run to determine whether the innovative behaviour influences the adoption. The dependent variable is coded with 1 (adoption) and 0 (rejection), the reference category being 1. Therefore, the regression model will estimate the chances of adoption depending on the values of the independent variable. As for the independent variable, it is an ordinal variable, so its reference values will be the lower values (the model will

evaluate the chance of adoption for subjects with higher values compared with the subjects with lower values of innovative behaviour).

The goodness-of-fit indicators of the model are presented in Table VIII 89 and Table VIII 90. The Hosmer-Lemeshow test (Table VIII 89) is statistically significant: $\chi^2(3)=10.554$, p=0.014. In consequence, our model does not fit the data very well (the relationship could be non-linear, or there might be another important influencers that have not been considered). The Nagelkerke pseudo R square value (Table VIII 90) is 0.500; therefore, about 50% of the variation in the dependent variable is explained by the independent variable.

The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 91. The innovative behaviour has a significant influence on the adoption: B=1.919, Exp(B)=6.814, p<0.001. The relationship is positive and strong: subjects with high innovative behaviour levels have about 681% (or 6.8 times) more chances to adopt sustainability compared to the subjects with low innovative behaviour levels.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	10.554	3	.014

Table VIII - 89: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	130.150[a]	.246	.500

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table VIII - 90: The Nagelkerke Pseudo R Square Value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	ib	1.919	.282	46.157	1	.000	6.814	3.917	11.854
	Constant	-2.792	.618	20.382	1	.000	.061		

a. Variable(s) entered on step 1: ib.

Table VIII - 91: Regression Coefficients and Their Antilogarithms

8.4.2 Logistic Regression Analysis

8.4.2.1 Dependent Variable: Adoption

A binomial logistic regression analysis was run to determine whether the adoption (i.e. an employee's willingness to decide in favour of the implementation of new sustainability initiative(s)) is influenced by the following independent variables:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest
- Age
- Work Experience
- Education
- Gender
- Position

The goodness-of-fit indicators of the model are presented in Table VIII 92 and Table VIII 93. The Hosmer-Lemeshow test (Table VIII 92) is not statistically significant: $\chi^2(8)=3.733$, $p=0.880$. In consequence, our model fits the data well (the independent variables satisfactorily explain the dependent variable adoption). The Nagelkerke pseudo R square value (Table VIII 93) is 0.659; therefore, about 65% of the variation in the dependent variable is explained by the independent variables). The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 94.

The following variables have a significant influence on adoption ($p<0.05$):

- Subjective Norm ($B=0.546$, $Exp(B)=1.726$, $p=0.029$). The relationship is positive: employees working in an environment with high levels of pro-sustainability subjective norm have 172% more chances (on average) to adopt sustainability compared to employees who work in an environment with low levels of pro-sustainability subjective norm.
- Perceived Behavioural Control ($B=1.181$, $Exp(B)=3.526$, $p<0.001$). The relationship is positive: subjects with high perceived behavioural control have 352% more chances to adopt sustainability compared to the subjects with low perceived behavioural control.

The other variables do not have a significant influence on the adoption (p>0.05).

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.733	8	.880

Table VIII - 92: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	94.002[a]	.324	.659

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

Table VIII - 93: The Nagelkerke Pseudo R Square Value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	ppers	.492	.297	2.750	1	.097	1.636	.914	2.929
	purg	.369	.344	1.150	1	.284	1.447	.737	2.841
	pconseq	-.048	.313	.024	1	.877	.953	.516	1.761
	snorm	.546	.250	4.764	1	.029	1.726	1.057	2.817
	percbehc	1.181	.252	21.921	1	.000	3.256	1.987	5.338
	psint	.356	.329	1.174	1	.278	1.428	.750	2.719
	age	.164	.441	.139	1	.709	1.178	.497	2.796
	workexp	.220	.366	.361	1	.548	1.246	.608	2.554
	educ	.208	.339	.377	1	.539	1.231	.634	2.391
	gender(1)	-.523	.591	.782	1	.376	.593	.186	1.889
	position	.467	.500	.871	1	.351	1.595	.598	4.253
	Constant	-12.646	2.362	28.659	1	.000	.000		

a. Variable(s) entered on step 1: ppers, purg, pconseq, snorm, percbehc, psint, age, workexp, educ, gender, position.

Table VIII - 94: Regression Coefficients and Their Antilogarithms

8.4.2.2 Dependent Variable: Continued Adoption

A binomial logistic regression analysis was run to determine whether the continued adoption is influenced by the following independent variables:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences
- Age
- Work Experience
- Education

- Gender
- Position

The goodness-of-fit indicators of the model are presented in Table VIII 95 and Table VIII 96. The Hosmer-Lemeshow test (Table VIII 95) is not statistically significant: $\chi^2(8)=4.916$, p=0.776. In consequence, our model fits the data well (the independent variables satisfactorily explain the dependent variable continued adoption). The Nagelkerke pseudo R square value (Table VIII 96) is 0.097; therefore, about 9% of the variation in the dependent variable is explained by the independent variables). The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 97.

The only variable that has a significant influence on continued adoption is position: B=-1.052, Exp(B)=0.349, p=0.049. The relationship is negative: subjects with high positions have 65% less chances (on average) to adopt sustainability compared to the subjects with lower positions.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	4.916	8	.767

Table VIII - 95: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	60.396[a]	.020	.097

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table VIII - 96: The Nagelkerke Pseudo R Square Value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	ppers	-.011	.364	.001	1	.976	.989	.484	2.021
	purg	.316	.525	.363	1	.547	1.372	.491	3.835
	pconseq	.311	.399	.610	1	.435	1.365	.625	2.983
	age	.024	.590	.002	1	.968	1.024	.322	3.254
	workexp	.351	.492	.507	1	.476	1.420	.541	3.727
	educ	.493	.434	1.289	1	.256	1.637	.699	3.835
	gender(1)	.874	.897	.951	1	.330	2.397	.413	13.900
	position	-1.052	.535	3.869	1	.049	.349	.123	.996
	Constant	-.817	2.831	.083	1	.773	.442		

a. Variable(s) entered on step 1: ppers, purg, pconseq, age, workexp, educ, gender, position.

Table VIII - 97: Regression Coefficients and Their Antilogarithms

8.4.2.3 Dependent Variable: Later Adoption

A binomial logistic regression analysis was run to determine whether the later adoption is influenced by the following independent variables:

- Observability
- Age
- Work Experience
- Education
- Gender
- Position

The goodness-of-fit indicators of the model are presented in Table VIII 98 and Table VIII 99. The Hosmer-Lemeshow test (Table VIII 98) is not statistically significant: $\chi^2(7)=6.536$, p=0.479. In consequence, our model fits the data well. The Nagelkerke pseudo R square value (Table VIII 99) is 0.182; therefore, about 18% of the variation in the dependent variable is explained by the independent variables). The regression coefficients (B) and their antilogarithms (Exp(B)) are presented in Table VIII 100. None of the independent variables have a significant effect on later adoption (p>0.05).

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	6.536	7	.479

Table VIII - 98: The Hosmer-Lemeshow Test

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	47.146[a]	.135	.182

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table VIII - 99: The Nagelkerke Pseudo R Square Value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	observ	.491	.439	1.249	1	.264	1.634	.691	3.864
	age	.385	.663	.338	1	.561	1.470	.401	5.387
	workexp	-.092	.498	.034	1	.853	.912	.344	2.419
	educ	-.899	.546	2.705	1	.100	.407	.140	1.188
	gender(1)	-.639	.845	.573	1	.449	.528	.101	2.763
	position	.528	.563	.880	1	.348	1.696	.562	5.114
	Constant	1.343	1.719	.611	1	.435	3.832		

a. Variable(s) entered on step 1: observ, age, workexp, educ, gender, position.

Table VIII - 100: Regression Coefficients and Their Antilogarithms

8.4.3 Analysis of Mediation Effects

8.4.3.1 Dependent Variable: Intention and Mediator: Attitude

This section presents the analysis of mediation effects of the variable attitude between the following independent variables and intention, as a dependent variable:

- Knowledge
- Perceived Relative Advantage
- Perceived Compatibility
- Perceived Complexity
- Perceived Risk
- Observability
- Communicability
- Trialability

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarised in Table VIII 101 below.

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Knowledge → Attitude → Intention	0.042	5.993	<0.001	0.607	0.353	42%
Perceived Relative Advantage → Attitude → Intention	0.048	7.027	<0.001	0.811	0.349	46%
Perceived Compatibility → Attitude → Intention	0.053	6.153	<0.001	0.847	0.546	38%
Perceived Complexity → Attitude → Intention	0.039	-6.787	<0.001	-0.613	-0.347	43%
Perceived Risk → Attitude → Intention	0.044	7.137	<0.001	-0.580	-0.265	54%
Observability → Attitude → Intention	0.037	7.223	<0.001	0.559	0.291	48%
Communicability → Attitude → Intention	0.045	6.927	<0.001	0.637	0.324	49%
Trialability → Attitude → Intention	0.040	5.499	<0.001	0.425	0.200	53%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 101: Mediation Effects: Dependent Variable: Intention and Mediator: Attitude

All the mediation effects are statistically significant ($p<0.05$) and are medium sized. The strongest mediation effect is between perceived risk and intention (54% of the total effect) as well as between trialability and intention (53%). The following relationships are negative:

- Perceived Complexity – Intention
- Perceived Risk – Intention

The other relationships are positive.

8.4.3.2 Dependent Variable: Adoption and Mediator: Intention

This section presents the analysis of mediation effects of the variable intention between the following independent variables and adoption, as a dependent variable:

- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarised in Table VIII 102 below.

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Subjective Norm → Intention → Adoption	0.030	4.701	<0.001	1.043	0.831	20%
Perceived Behavioural Control → Intention → Adoption	0.032	4.606	<0.001	1.561	1.357	13%
Perceived Self Interest → Intention → Adoption	0.031	4.846	<0.001	1.229	0.813	34%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 102: Mediation Effects: Dependent Variable: Adoption and Mediator: Intention

All the mediation effects are statistically significant ($p<0.001$), but they are low in size. The strongest mediation effect appears between perceived self interest and adoption (34% of the total effect). All the relationships between variables are positive.

8.4.3.3 Dependent Variable: Behaviour and Mediator: Intention

This section presents the analysis of mediation effects of the variable intention between the following independent variables and behaviour, as a dependent variable:

- Subjective Norm
- Perceived Behavioural Control
- Perceived Self Interest

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 103 below.

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Subjective Norm → Intention → Behaviour	0.033	7.936	<0.001	0.464	0.197	58%
Perceived Behavioural Control → Intention → Behaviour	0.038	8.857	<0.001	0.677	0.337	50%
Perceived Self Interest → Intention → Behaviour	0.045	7.878	<0.001	0.495	0.135	73%

c is the regression coefficient of the direct relationship between the independent and the dependent variable
c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator
The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 103: Mediation Effects: Dependent Variable: Behaviour and Mediator: Intention

All the mediation effects are statistically significant (p<0.001). A very strong mediation effect appears between perceived self interest and behaviour (73% of the total effect). In conclusion, the variable intention seems to have a big effect on behaviour, almost suppressing the effects of perceived self interest. All the relationships between variables are positive.

8.4.3.4 Dependent Variable: Continued adoption and Mediator: Behaviour

This section presents the analysis of mediation effects of the variable behaviour between the following independent variables and adoption, as a dependent variable:

- Perceived Persuader Legitimacy
- Perceived Urgency
- Perceived Consequences

In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 104 below.

Path	Sobel test	z value	p value	c	c'	Proportion due to

	value					mediation
Perceived Persuader Legitimacy → Behaviour → Continued Adoption	0.050	2.979	0.003	0.131	0.019	86%
Perceived Urgency → Behaviour → Continued Adoption	0.068	3.177	0.002	0.301	-0.199	166%
Perceived Consequences → Behaviour → Continued Adoption	0.039	2.494	0.014	0.234	0.057	76%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 104: Mediation Effects: Dependent: Continued Adoption and Mediator: Behaviour

All the mediation effects are statistically significant ($p<0.05$). The proportion due to mediation for the path Perceived consequences → Behaviour → Continued adoption indicates that there is no direct relationship between perceived consequences and continued adoption (the continued adoption is totally explained by the variable behaviour). The actual relationship between behaviour and continued adoption is negative. Strong mediation effect appears for the other two paths, too (86% and 76% of the total effect). In consequence, the variable behaviour has a great influence on continued adoption.

8.4.3.5 Dependent Variable: Later adoption and Mediators: Attitude, Intention

This section presents the analysis of mediation effects of the variables attitude and intention between observability as an independent variable and later adoption, as a dependent variable. In order to evaluate the mediation effects, the Barron and Kenny approach and the Sobel mediation test were used. The results are summarized in Table VIII 105 below.

Path	Sobel test value	z value	p value	c	c'	Proportion due to mediation
Observability → Attitude → Later Adoption	0.028	2.160	0.031	1.692	1.363	19%
Observability → Intention → Later Adoption	0.050	2.793	0.005	1.692	0.926	45%

c is the regression coefficient of the direct relationship between the independent and the dependent variable

c' is the regression coefficient of the relationship between the independent and the dependent variable, controlled for the mediator

The proportion due to mediation is computed with the formula *((c-c')/c)*100*

Table VIII - 105: Mediation Effects: Dependent Variable: Later adoption and Mediators: Attitude, Intention

All the mediation effects are statistically significant ($p<0.05$). The strongest mediation effect is the intention effect (45% of the total effect). Both relationships between variables are positive.

8.4.4 Structural Equation Modelling

In addition to testing the research hypotheses, this study sought to validate the structural architecture of the proposed 'sustainability diffusion model'. This was done in three sequential steps. In the first step, the structure of Ajzen's Theory of Planned Behaviour was modelled. In the second step, the structure of Rogers' (1983) Innovation-Decision Process Model was modelled. Lastly, the proposed model which combines and expands both Ajzen's theory and Rogers' model was modelled.

8.4.4.1 Structural Model #1

A structural equation model was built in order to verify the relationships between the following latent constructs:

- Attitude Towards Behaviour
- Subjective Norm
- Perceived Behavioural Control
- Intention
- Behaviour

The model is shown in Figure VIII 22 and Figure VIII 23. To estimate the model parameters, the maximum likelihood method was employed.

Figure VIII - 22: Ajzen's (1991) Theory of Planned Behaviour

The cutoff values used to assess the goodness-of-fit were the following: for the root mean square error of approximation (RMSEA) – 0.08, for the comparative fit index (CFI) – 0.900, for the standardized root mean square residual (SRMR) – 0.08, for the χ^2/df ratio – between 1 and 5. The goodness-of-fit statistics for our model are: $\chi^2(27)=51.038$, $p=0.003$, $\chi 2/df=1.890$, $RMSEA=0.052$, $CFI=0.990$, $SRMR=0.027$. All the indices meet the cutoff value; thus, our model is a very good fit. The average variance explained (AVE) and the composite reliability (CR) for the latent variables attitude, intention and behaviour are shown in Table VIII 106.

Model 1	AVE	CR
Attitude	0.861	0.911
Intention	0.812	0.882
Behaviour	0.833	0.882

Table VIII - 106: Average Variance Explained (AVE) and Composite Reliability (CR)

All three construct have a very good internal consistency (the CRs are higher than 0.800). Also, they present a very good convergent validity (the average variance extracted are greater than 0.500). In order to assess the discriminant validity, we have compared the average variance extracted with the squared correlations between constructs. These figures are summarized in Table VIII 107.

	Attitude	Intention	Behaviour
Attitude	**0.861**		
Intention	0.500	**0.812**	
Behaviour	0.483	0.679	**0.833**

Table VIII - 107: Discriminant Validity

All the average variance extracted is greater than the squared correlations, which indicates good discriminant validity. The path weights for the measurement model are presented in Table VIII 108.

Path	B	Beta	p
a1 ← Attitude	1	0.939	-
a2 ← Attitude	0.987	0.870	<0.001
sn1 ← Subjective Norm	1	0.863	-
sn2 ← Subjective Norm	0.792	0.776	<0.001
pbc1 ← Perceived Behavioural Control	1	0.861	-
pbc2 ← Perceived Behavioural Control	1.053	0.886	<0.001
i1 ← Intention	1	0.862	-
i2 ← Intention	1.137	0.966	<0.001
b1 ← Behaviour	1	0.956	-
b2 ← Behaviour	0.970	0.902	<0.01

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 108: Path Weights

All the weights are statistically significant ($p<0.001$) and all the standardized weights are greater than 0.500. Thus, the individual items are well explained by their underlying factors.

The regression coefficients for the structural (causal) model can be seen in Table VIII 109.

Path	B	Beta	p
Intention ← Attitude	0.550	0.527	<0.001
Intention ← Subjective Norm	0.087	0.118	0.073
Intention ← Perceived Behavioural Control	0.177	0.178	0.010

Behaviour ← Intention	0.784	0.652	<0.001
Behaviour ← Perceived Behavioural Control	0.386	0.323	<0.001

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 109: Regression Coefficients

The regression coefficient for the path subjective norm – attitude is not statistically significant (p=0.073), so subjective norm does not influence intention. All the other coefficients are significant (p<0.05). Furthermore, all the relationships are positive. By inspection of Table VIII 109, one can reach the following conclusions:

- One unit increase in attitude leads to 0.550 units increase in intention.
- One unit increase in perceived behavioural control leads to 0.177 units increase in intention.
- One unit increase in intention leads to 0.784 units increase in behaviour.
- One unit increase in perceived behavioural control leads to 0.386 units increase in intention.

The means, standard deviations and standard error means of the latent variables attitude, intention and behaviour can be found in Table VIII 110.

Model 1	Mean	SD	SE
Attitude	0.007	0.970	0.053
Intention	-0.030	1.005	0.055
Behaviour	-0.008	1.198	0.065

Table VIII - 110: Means, Standard Deviations and Standard Error Means

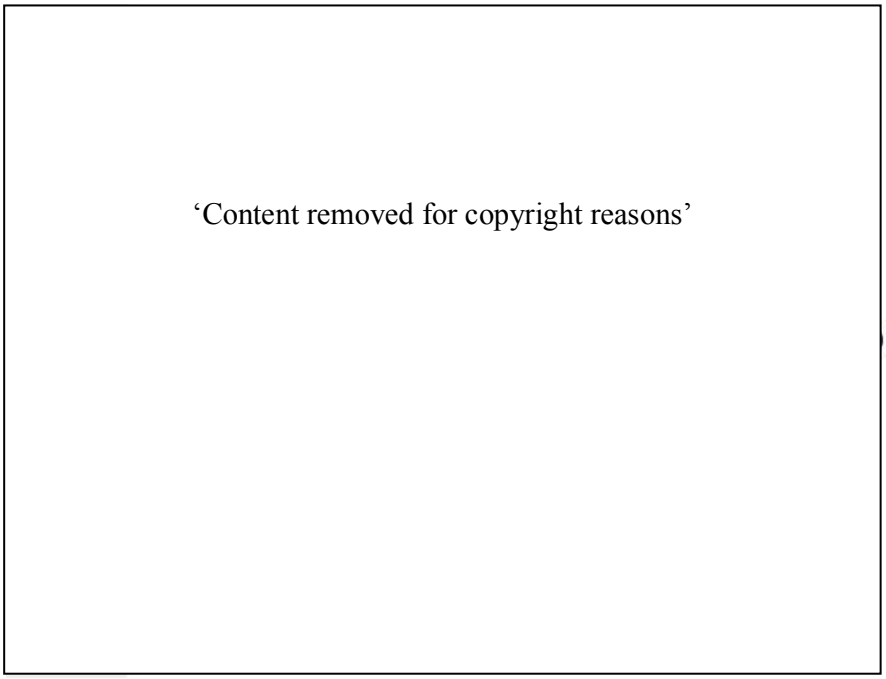


Figure VIII - 23: Structural Equation Modelling of Ajzen's (1991) Theory of Planned Behaviour

8.4.4.2 Structural Model #2

A structural equation model was built in order to verify the relationships between the following latent constructs:

- Knowledge
- Attitude Towards Behaviour
- Intention
- Behaviour
- Confirmation

The model is presented in Figure VIII 24 and Figure VIII 25. To estimate the model parameters, the maximum likelihood method was employed. The cutoff values used to assess the goodness-of-fit were the following: for the root mean square error of approximation (RMSEA) – 0.08, for the comparative fit index (CFI) – 0.900, for the standardized root mean square residual (SRMR) – 0.08, for the χ^2/df ratio – between 1 and 5. The goodness-of-fit statistics for our model are: $\chi^2(145)=420.215$, $p<0.001$, $\chi^2/df=2.898$, RMSEA=0.076, CFI=0.946, SRMR=0.063. All the indicators meet the cutoff values, so our model is a very good fit.

The average variance explained (AVE) and the composite reliability (CR) for the latent variables attitude, intention and behaviour can be seen in Table VIII 111.

Model 1	**AVE**	**CR**
Attitude	0.829	0.911
Intention	0.802	0.877
Behaviour	0.803	0.882

Table VIII - 111: Average Variance Explained (AVE) and Composite Reliability (CR)

All three construct have a very good internal consistency (the CRs are higher than 0.800). Also, they present a very good convergent validity (the average variance extracted are greater than 0.500). In order to assess the discriminant validity, we have compared the average variance extracted with the squared correlations between constructs. These figures are summarized in Table VIII 112.

	Attitude	Intention	Behaviour
Attitude	**0.829**		
Intention	0.551	**0.802**	
Behaviour	0.524	0.760	**0.803**

Table VIII - 112: Discriminant Validity

All the average variance extracted is greater than the squared correlations, which indicates good discriminant validity.

The path weights for the measurement model are presented in Table VIII 113.

Path	B	Beta	P
a1 ← Attitude	1	0.926	-
a2 ← Attitude	1.016	0.883	<0.001
k1 ← Knowledge	1	0.800	-
k2 ← Knowledge	1.141	0.925	<0.001
pc1 ← Perceived Compatibility	1	0.944	-
pc2 ← Perceived Compatibility	0.988	0.912	<0.001
i1 ← Intention	1	0.856	-
i2 ← Intention	1.107	0.934	<0.001
b1 ← Behaviour	1	0.962	-
b2 ← Behaviour	0.953	0.893	<0.001
conf1 ← Confirmation	1	0.921	-
conf2 ← Confirmation	0.847	0.746	<0.001
pcx1 ← Perceived Complexity	1	0.835	-
pcx2 ← Perceived Complexity	1.055	0.920	<0.001
pra1 ← Perceived Relative Advantage	1	0.564	-
pra2 ← Perceived Relative Advantage	0.901	0.639	<0.001
o1 ← Observability	1	0.857	-
o2 ← Observability	0.989	0.865	<0.001
t1 ← Trialability	1	0.829	-
t2 ← Trialability	1.133	0.924	<0.001

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 113: Path Weights

All the weights are statistically significant ($p<0.001$) and almost all the standardized weights are greater than 0.500. The individual items are well explained by their underlying factors.

The regression coefficients for the structural (causal) model can be seen in Table VIII 114.

Path	B	Beta	P
Attitude ← Knowledge	-0.160	-0.119	0.069
Attitude ← Perceived Complexity	0.035	0.030	0.670
Attitude ← Perceived Compatibility	0.343	0.277	0.026
Attitude ← Perceived Relative Advantage	0.840	0.481	0.020
Attitude ← Observability	0.216	0.224	0.009
Attitude ← Trialability	-0.041	-0.034	0.537
Intention ← Attitude	0.171	0.163	0.105
Intention ← Perceived Relative Advantage	1.388	0.757	<0.001
Behaviour ← Intention	1.071	0.878	<0.001
Confirmation ← Behaviour	1.069	0.915	<0.001

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 114: Regression Coefficients

By visual inspection of Table VIII 114, one can draw the following conclusions:

- Knowledge, perceived complexity and trialability do not have an impact on attitude.
- Attitude does not have an impact on intention ($p>0.05$).
- The perceived compatibility has a significant, positive impact on the attitude (one unit increase in perceived compatibility leads to 0.343 units increase in attitude).
- The perceived relative advantage has a significant, positive impact on the attitude (one unit increase in perceived relative advantage leads to 0.840 units increase in attitude).
- The observability has a significant, positive impact on the attitude (one unit increase in observability leads to 0.216 units increase in attitude).
- The relative advantage has a significant, positive impact on the intention (one unit increase in perceived relative advantage leads to 1.388 units increase in intention).
- The intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 1.071 units increase in behaviour).
- The behaviour has a significant, positive impact on confirmation (one unit increase in behaviour leads to 1.069 units increase in confirmation).

The means, standard deviations and standard error means of the latent variables attitude, intention and behaviour can be found in Table VIII 115.

Model 1	Mean	SD	SE
Attitude	-0.015	0.983	0.054
Intention	0.003	0.982	0.054
Behaviour	-0.011	1.219	0.067

Table VIII - 115: Means, Standard Deviations and Standard Error Means

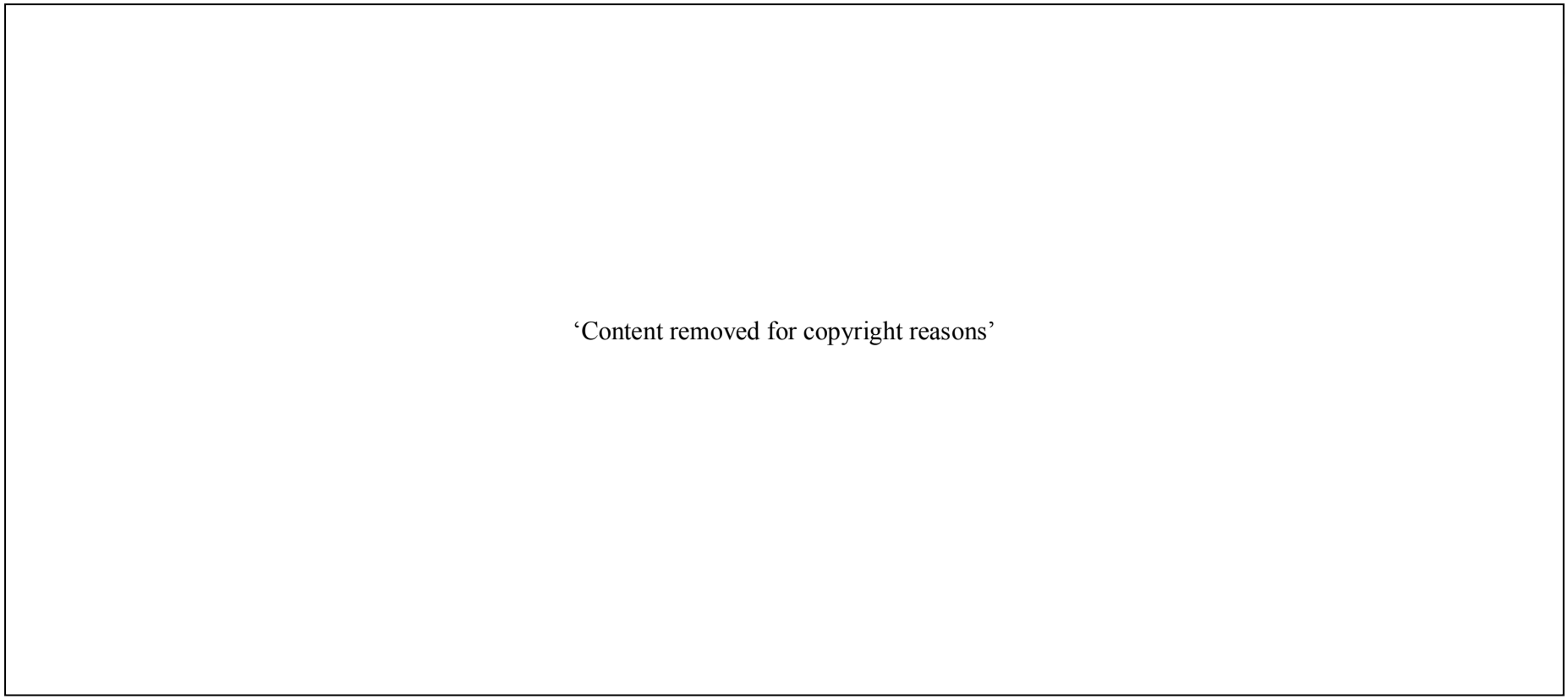


Figure VIII - 24: Rogers' (1983) Innovation-Decision Process Model

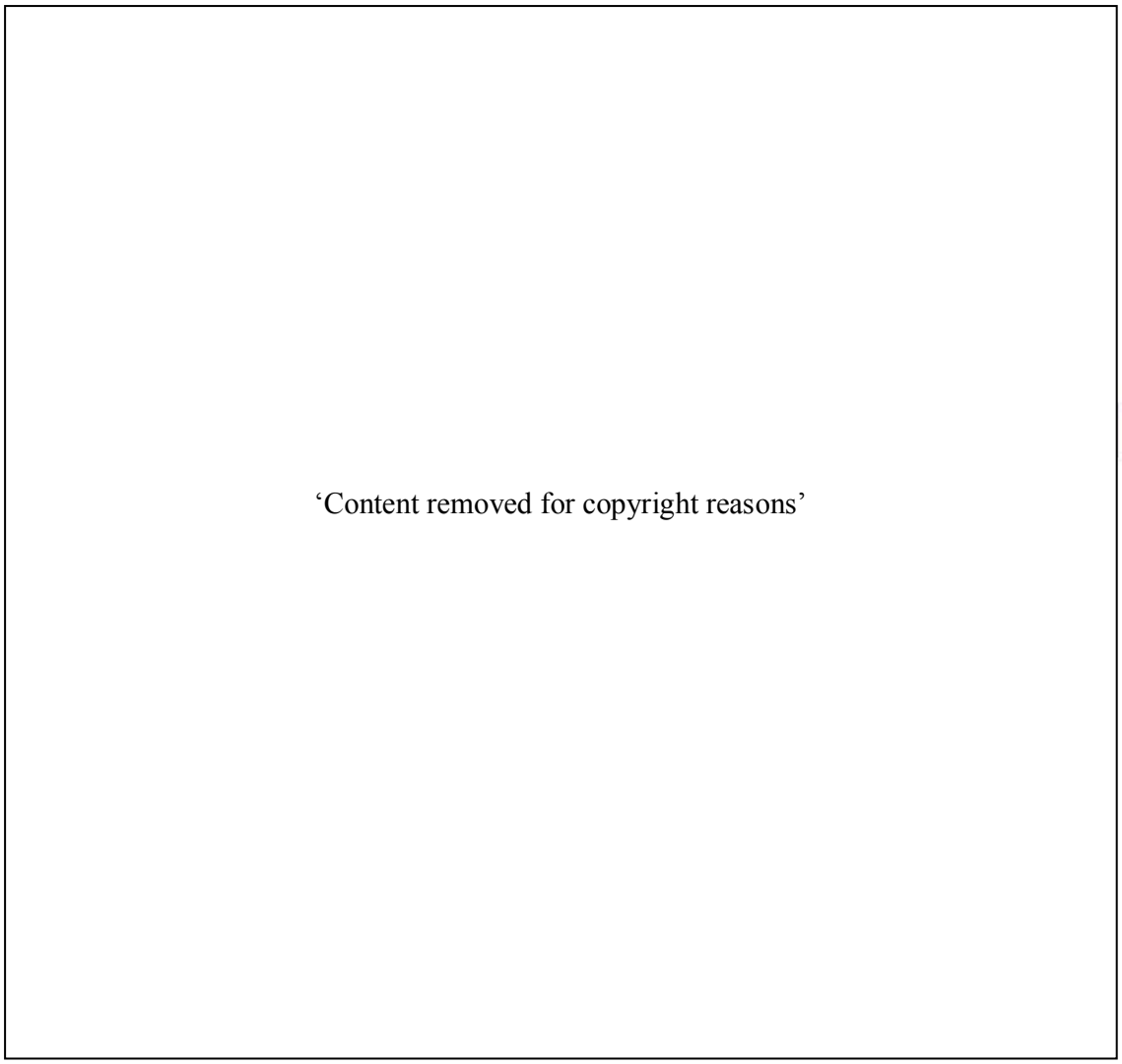


Figure VIII - 25: Structural Equation Modelling of Rogers' (1983) Innovation-Decision Process Model

8.4.4.3 Structural Model #3

A structural equation model was built in order to verify the relationships between the following latent constructs:

- Knowledge
- Attitude Towards Behaviour
- Intention
- Behaviour
- Confirmation

The model is presented in Figure VIII 26 and Figure VIII 27. To estimate the model parameters, the maximum likelihood method was employed. The cutoff values used to assess the goodness-of-fit were the following: for the root mean square error of approximation (RMSEA) – 0.08, for the comparative fit index (CFI) – 0.900, for the standardized root mean square residual (SRMR) – 0.08, for the χ^2/df ratio – between 1 and 5. The goodness-of-fit statistics for our model are: $\chi^2(628)=1266.790$, $p<0.001$, $\chi 2/df=1.953$, RMSEA=0.054, CFI=0.941, SRMR=0.052. All the indicators meet the cutoff value; therefore, our model is a very good fit.

The average variance explained (AVE) and the composite reliability (CR) for the latent variables attitude, intention and behaviour can be seen in Table VIII 116.

Model 1	AVE	CR
Attitude	0.826	0.911
Intention	0.811	0.879
Behaviour	0.803	0.882

Table VIII - 116: Average Variance Explained (AVE) and Composite Reliability (CR)

All three construct have a very good internal consistency (the CRs are higher than 0.800). Also, they present a very good convergent validity (the average variance extracted are greater than 0.500). In order to assess the discriminant validity, we have compared the average variance extracted with the squared correlations between constructs. These figures are summarised in Table VIII 117.

	Attitude	Intention	Behaviour
Attitude	**0.826**		
Intention	0.494	**0.811**	
Behaviour	0.462	0.741	**0.803**

Table VIII - 117: Discriminant Validity

All the average variance extracted is greater than the squared correlations, which indicates good discriminant validity. The path weights for the model are presented in Table VIII 118.

Path	B	Beta	p
a1 ← Attitude	1	0.930	-
a2 ← Attitude	1.004	0.877	<0.001
k1 ← Knowledge	1	0.662	-
k2 ← Knowledge	1.070	0.718	<0.001
pc1 ← Perceived Compatibility	1	0.944	-
pc2 ← Perceived Compatibility	0.987	0.912	<0.001
i1 ← Intention	1	0.861	-
i2 ← Intention	1.109	0.841	<0.001
b1 ← Behaviour	1	0.961	-
b2 ← Behaviour	0.956	0.894	<0.001
conf1 ← Confirmation	1	0.918	-
conf2 ← Confirmation	0.851	0.747	<0.001
pcx1 ← Perceived Complexity	1	0.867	-
pcx2 ← Perceived Complexity	0.978	0.886	<0.001
pra1 ← Perceived Relative Advantage	1	0.589	-
pra2 ← Perceived Relative Advantage	0.874	0.689	<0.001
o1 ← Observability	1	0.854	-
o2 ← Observability	0.995	0.868	<0.001
t1 ← Trialability	1	0.816	-
t2 ← Trialability	1.169	0.938	<0.001
pra1 ← Perceived Argument Quality	1	0.934	-
pra2 ← Perceived Argument Quality	1.096	0.904	<0.001
psc1 ← Perceived Source Credibility	1	0.859	-
psc2 ← Perceived Source Credibility	1.066	0.900	<0.001
pr1 ← Perceived Risk	1	0.879	-
pr2 ← Perceived Risk	0.935	0.754	<0.001
c1 ← Communicability	1	0.906	-
c2 ← Communicability	1.048	0.934	<0.001
sn1 ← Subjective Norm	1	0.870	-
sn2 ← Subjective Norm	0.778	0.770	<0.001
pbc1 ← Perceived Behavioural Control	1	0.864	-
pbc2 ← Perceived Behavioural Control	1.050	0.888	<0.001
psi1 ← Perceived Self Interest	1	0.877	-
psi2 ← Perceived Self Interest	1.097	0.885	<0.001
ppl1 ← Perceived Persuader Legitimacy	1	0.979	-
ppl2 ← Perceived Persuader Legitimacy	0.922	0.899	<0.001
pu1 ← Perceived Urgency	1	0.914	-
pu2 ← Perceived Urgency	0.919	0.893	<0.001
pcon1 ← Perceived Consequences	1	0.958	-
pcon2 ← Perceived Consequences	0.974	0.903	<0.001

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 118: Path Weights

All the weights are statistically significant ($p<0.01$) and all the standardized weights are greater than 0.500. The individual items are very well explained by their underlying factors.

The regression coefficients for the structural (causal) model can be seen in Table VIII 119.

Path	B	Beta	P
Attitude ← Perceived Complexity	0.025	0.022	0.727
Attitude ← Perceived Compatibility	0.408	0.328	<0.001
Attitude ← Perceived Relative Advantage	0.212	0.131	0.350
Attitude ← Observability	0.240	0.247	<0.001
Attitude ← Trialability	-0.068	-0.055	0.290
Attitude ← Perceived Argument Quality	0.091	0.078	0.271
Attitude ← Perceived Source Credibility	-0.089	-0.068	0.242
Attitude ← Perceived Risk	-0.230	-0.191	0.002
Attitude ← Communicability	0.136	0.108	0.055
Intention ← Attitude	0.258	0.245	<0.001
Intention ← Perceived Relative Advantage	0.927	0.542	<0.001
Intention ← Subjective Norm	0.018	0.025	0.699
Intention ← Perceived Behavioural Control	0.094	0.095	0.179
Intention ← Perceived Self Interest	0.099	0.093	0.084
Behaviour ← Intention	1.003	0.829	<0.001
Behaviour ← Perceived Persuader Legitimacy	0.083	0.078	0.041
Behaviour ← Perceived Urgency	0.074	0.052	0.258
Behaviour ← Perceived Consequences	-0.052	-0.048	0.232
Confirmation ← Behaviour	1.071	0.918	<0.001

B – unstandardized path weight
Beta - standardized path weight

Table VIII - 119: Regression Coefficients

By visual inspection of Table VIII 119, one can draw the following conclusions:

- The perceived compatibility has a significant, positive impact on the attitude (one unit increase in perceived compatibility leads to 0.408 units increase in attitude).
- The observability has a significant, positive impact on the attitude (one unit increase in perceived compatibility leads to 0.240 units increase in attitude).
- The perceived risk has a significant, negative impact on the attitude (one unit increase in perceived risk leads to 0.230 units decrease in attitude).
- The attitude has a significant, positive impact on the intention (one unit increase in attitude leads to 0.258 units increase in intention).
- The relative advantage has a significant, positive impact on the intention (one unit increase in perceived relative advantage leads to 0.927 units increase in intention).

- The intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 1.003 units increase in behaviour).
- The persuader legitimacy has a significant, positive impact on the behaviour (one unit increase in perceived persuader legitimacy leads to 0.083 units increase in behaviour).
- The behaviour has a significant, positive impact on the confirmation (one unit increase in behaviour leads to 1.071 units increase in confirmation).

The relationships between the other latent constructs are not statistically significant ($p>0.05$).

The means, standard deviations and standard error means of the latent variables attitude, intention and behaviour can be found in Table VIII 120.

Model 1	Mean	SD	SE
Attitude	-0.016	0.974	0.053
Intention	0.011	1.036	0.056
Behaviour	-0.017	1.211	0.066

Table VIII - 120: Means, Standard Deviations and Standard Error Means

The main goodness-of-fit indicators for the three models are presented in Table VIII 121.

	χ^2/df	CFI	NFI	IFI	TLI	RMSEA	SRMR
Model 1	1.890	0.990	0.980	0.991	0.984	0.052	0.027
Model 2	2.898	0.946	0.920	0.946	0.929	0.076	0.063
Model 3	1.953	0.941	0.889	0.942	0.927	0.054	0.052

Table VIII - 121: Goodness-Of-Fit Indicators

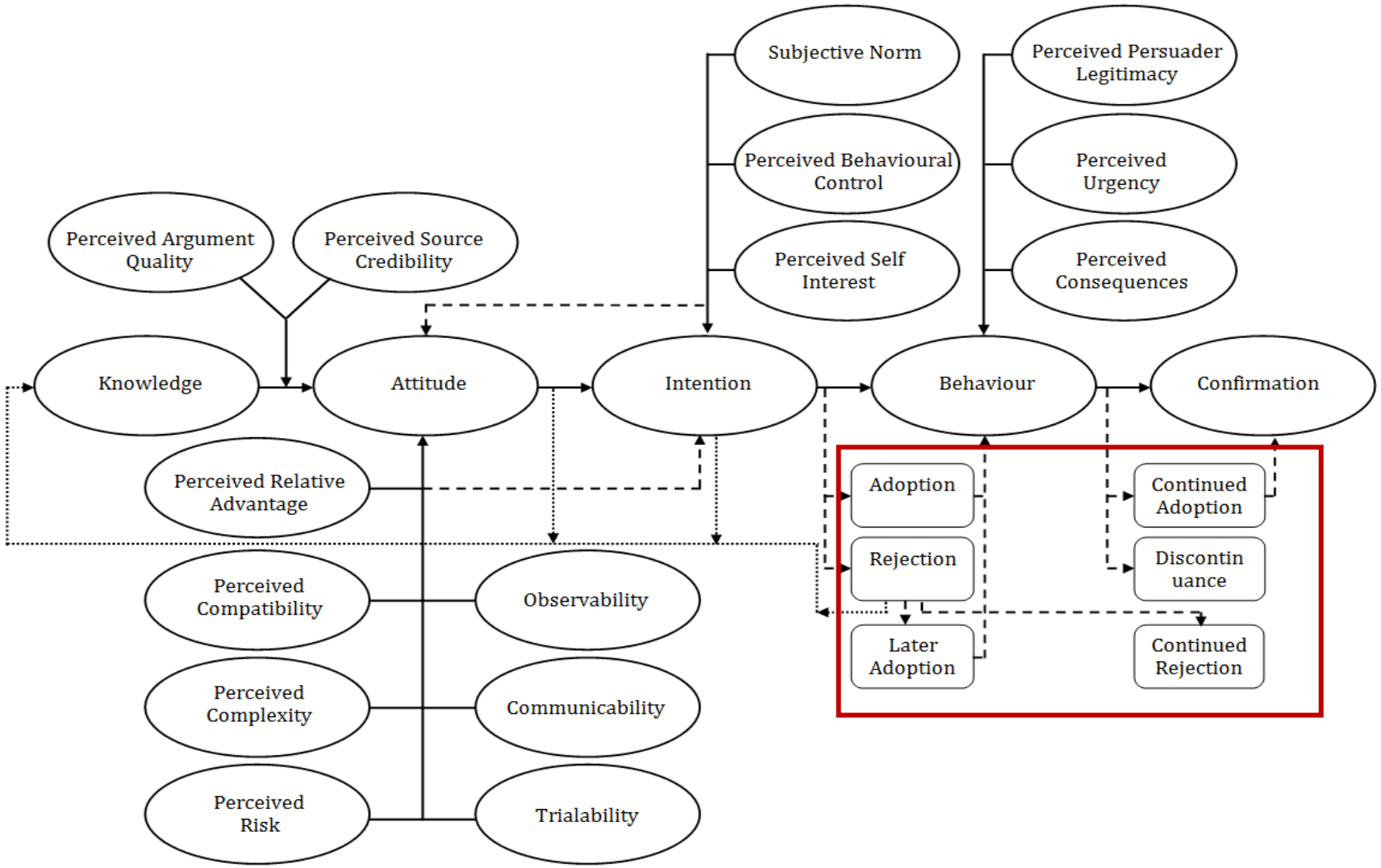


Figure VIII - 26: The Proposed Sustainability Diffusion Model

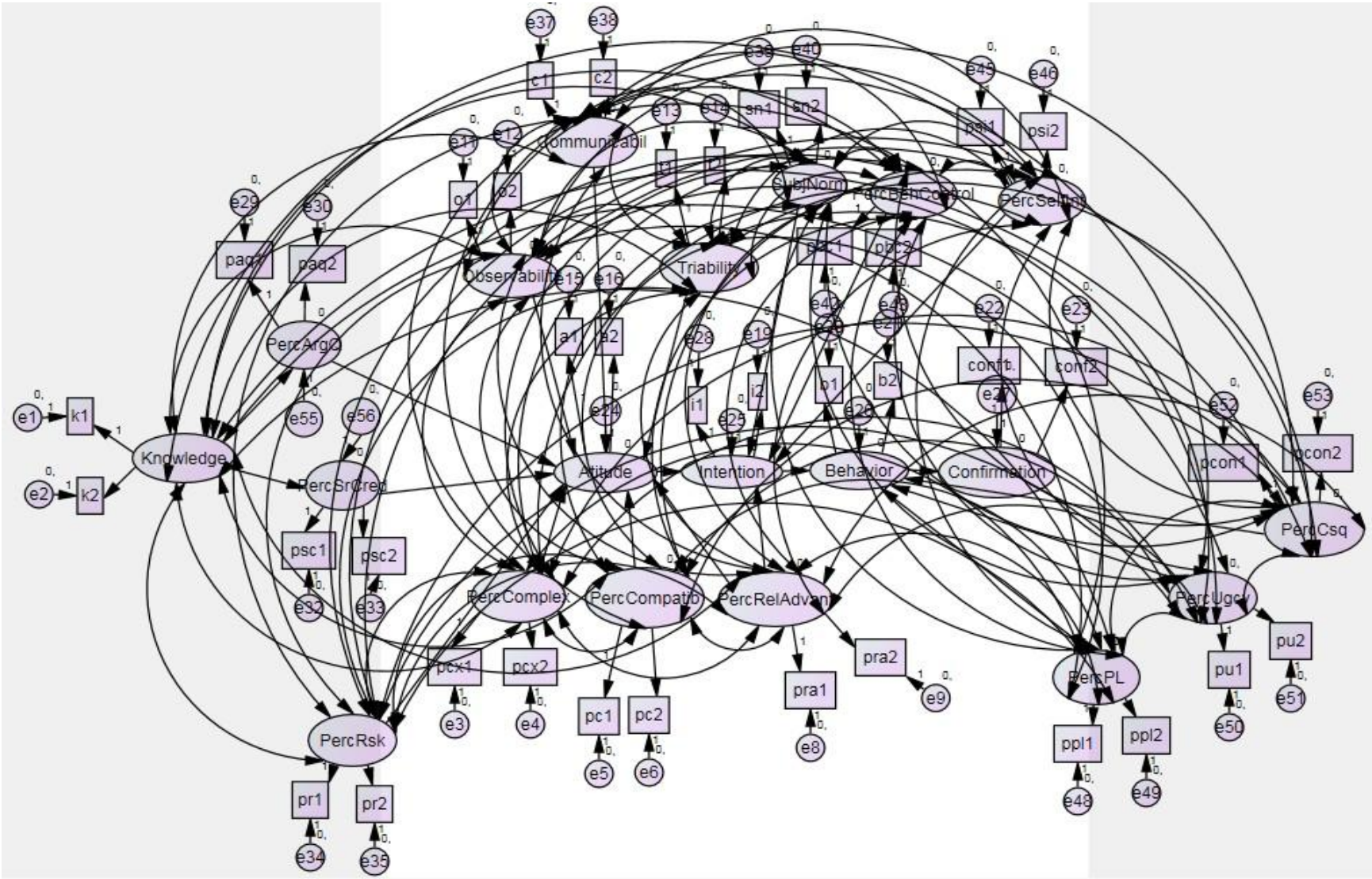


Figure VIII - 27: Structural Equation Modelling of the Proposed Sustainability Diffusion Model

8.5 Conclusions

This chapter analysed and interpreted the data collected for three separate empirical investigations, namely: the diffusion of duplex printing; the diffusion of sustainable computing; and the diffusion of sustainability culture. The three investigations sought to empirically test the research hypotheses put forth in Chapter VI and validate the structural architecture of the proposed 'sustainability diffusion model'. Many of the proposed hypotheses were accepted and very few hypotheses were rejected. However, a large number of hypothesised relationships were found to be statistically insignificant (*See* Tables: VIII 122; VIII 123; VIII 124; VIII 125; VIII 126). The only hypothesis that was rejected in all three studies was H15a. It hypothesised that persuader legitimacy is positively related to the rate by which sustainability initiatives/behaviours/ practices are diffused.

SEM was used to test or validate the structural architecture of: the theory of planned behaviour; the diffusion of innovations theory; and the proposed sustainability diffusion model. The SEM results indicate that the structural architecture of the theory of planned behaviour is perfect. All the hypotheses that underline the theory's paths were supported (*See* Table VIII 127). In contrast, the structural architecture of the diffusion of innovations theory was weakly supported. Some of the paths were rejected in at least two occasions, namely: attitude and knowledge; attitude and perceived complexity; attitude and observability; and attitude and trialability (*See* Table VIII 128). Similarly, several paths in the proposed sustainability diffusion model were not accepted in two or in all of the three studies. The rejected paths were: attitude and observability; attitude and perceived risk; intention and attitude; and intention and perceived self-interest (*See* Table VIII 129).

The next chapter discusses the results of this research in relation to the academic literature and sheds some light on the areas of similarity and/or difference between the findings of this study and those of other scholars who may have investigated similar research problem(s).

No.	Hypothesis	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
1	H1a	Perceived Relative Advantage	Attitude	Accepted	Accepted	Accepted
2	H1b	Perceived Relative Advantage	Intention	Accepted	Accepted	Accepted
3	H1c	Perceived Relative Advantage	Rate of Diffusion	Rejected (-)	Accepted	Insignificant
4	H2a	Perceived Compatibility	Attitude	Accepted	Accepted	Accepted
5	H2b	Perceived Compatibility	Intention	Accepted	Accepted	Accepted
6	H2c	Perceived Compatibility	Rate of Diffusion	Rejected (-)	Accepted	Accepted
7	H3a	Perceived Complexity	Attitude	Rejected (+)	Accepted	Insignificant
8	H3b	Perceived Complexity	Intention	Insignificant	Insignificant	Accepted
9	H3c	Perceived Complexity	Rate of Diffusion	Insignificant	Insignificant	Insignificant
10	H4a	Perceived Risk	Attitude	Insignificant	Insignificant	Accepted
11	H4b	Perceived Risk	Intention	Accepted	Accepted	Accepted
12	H4c	Perceived Risk	Rate of Diffusion	Accepted	Insignificant	Accepted
13	H5a	Trialability	Attitude	Insignificant	Insignificant	Insignificant
14	H5b	Trialability	Intention	Insignificant	Insignificant	Insignificant
15	H5c	Trialability	Rate of Diffusion	Insignificant	Accepted	Insignificant
16	H6a	Observability	Attitude	Insignificant	Insignificant	Accepted
17	H6b	Observability	Intention	Insignificant	Insignificant	Accepted
18	H6c	Observability	Rate of Diffusion	Rejected (-)	Insignificant	Insignificant
19	H6d	Observability	Later Adoption	Insignificant	Insignificant	Insignificant
20	H7a	Communicability	Attitude	Accepted	Insignificant	Accepted
21	H7b	Communicability	Intention	Accepted	Insignificant	Accepted
22	H7c	Communicability	Rate of Diffusion	Accepted	Insignificant	Insignificant

Table VIII - 1: **Summary of Accepted and Rejected Hypotheses for Study I, Study II and Study III**

No.	Hypothesis	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
23	H8a	Knowledge	Attitude	Insignificant	Insignificant	Insignificant
24	H8b	Knowledge	Rate of Diffusion	Insignificant	Insignificant	Insignificant
25	H9a	Knowledge	Attitude	Insignificant	Insignificant	Insignificant
26	H9b	Knowledge	Rate of Diffusion	Accepted	Insignificant	Accepted
27	H10a	Subjective Norm	Attitude	Insignificant	Accepted	Insignificant
28	H10b	Subjective Norm	Intention	Accepted	Accepted	Insignificant
29	H10c	Subjective Norm	Rate of Diffusion	Insignificant	Insignificant	Insignificant
30	H10d	Subjective Norm	Behaviour	Accepted	Accepted	Accepted
31	H10e	Subjective Norm	Adoption	Insignificant	Accepted	Accepted
32	H11a	Behavioural Control	Attitude	Accepted	Insignificant	Accepted
33	H11b	Behavioural Control	Intention	Accepted	Accepted	Insignificant
34	H11c	Behavioural Control	Rate of Diffusion	Insignificant	Accepted	Insignificant
35	H11d	Behavioural Control	Behaviour	Accepted	Accepted	Accepted
36	H11e	Behavioural Control	Adoption	Accepted	Accepted	Accepted
37	H12a	Perceived Self-Interest	Attitude	Insignificant	Insignificant	Insignificant
38	H12b	Perceived Self-Interest	Intention	Insignificant	Insignificant	Accepted
39	H12c	Perceived Self-Interest	Rate of Diffusion	Insignificant	Insignificant	Insignificant
40	H12d	Perceived Self-Interest	Behaviour	Insignificant	Insignificant	Accepted
41	H12e	Perceived Self-Interest	Adoption	Insignificant	Insignificant	Insignificant
42	H13a	Perceived Consequences	Rate of Diffusion	Insignificant	Insignificant	Insignificant
43	H13b	Perceived Consequences	Behaviour	Insignificant	Insignificant	Insignificant
44	H13c	Perceived Consequences	Adoption	Insignificant	Insignificant	Insignificant
45	H13d	Perceived Consequences	Continued Adoption	Insignificant	Insignificant	Insignificant

Table VIII - 2: Summary of Accepted and Rejected Hypotheses for Study I, Study II and Study III (Continuation)

No.	Hypothesis	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
46	H14a	Perceived Urgency	Rate of Diffusion	Insignificant	Insignificant	Insignificant
47	H14b	Perceived Urgency	Behaviour	Accepted	Accepted	Accepted
48	H14c	Perceived Urgency	Adoption	Insignificant	Insignificant	Insignificant
49	H14d	Perceived Urgency	Continued Adoption	Insignificant	Accepted	Insignificant
50	H15a	Persuader Legitimacy	Rate of Diffusion	Rejected (-)	Rejected (-)	Insignificant
51	H15b	Persuader Legitimacy	Behaviour	Insignificant	Accepted	Insignificant
52	H15c	Persuader Legitimacy	Adoption	Insignificant	Insignificant	Insignificant
53	H15d	Persuader Legitimacy	Continued Adoption	Insignificant	Insignificant	Insignificant
54	H16a	Knowledge	Attitude	Insignificant	Insignificant	Rejected (-)
55	H16b	Knowledge	Attitude	Insignificant	Insignificant	Insignificant
56	H16c	Knowledge	Attitude	Insignificant	Insignificant	Insignificant
57	H16d	Knowledge	Intention	Accepted	Insignificant	Insignificant
58	H16e	Knowledge	Rate of Diffusion	Accepted	Insignificant	Insignificant
59	H17a	Attitude	Intention	Accepted	Rejected (-)	Accepted
60	H17b	Attitude	Knowledge and Intention	Accepted	Accepted	Accepted
61	H17c	Attitude	Relative Advantage and Intention	Accepted	Accepted	Accepted
62	H17d	Attitude	Compatibility and Intention	Accepted	Accepted	Accepted
63	H17e	Attitude	Complexity and Intention	Accepted	Accepted	Accepted
64	H17f	Attitude	Risk and Intention	Accepted	Accepted	Accepted
65	H17g	Attitude	Observability and Intention	Accepted	Accepted	Accepted
66	H17h	Attitude	Communicability and Intention	Accepted	Accepted	Accepted
67	H17i	Attitude	Trialability and Intention	Accepted	Accepted	Accepted
68	H17j	Attitude	Observability and Later Adoption	Accepted	Accepted	Accepted

Table VIII - 3: Summary of Accepted and Rejected Hypotheses for Study I, Study II and Study III (Continuation)

No.	Hypothesis	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
69	H18a	Intention	Adoption	Insignificant	Insignificant	Accepted
70	H18b	Intention	Behaviour	Accepted	Insignificant	Accepted
71	H18c	Intention	Subjective Norm and Behaviour	Accepted	Accepted	Accepted
72	H18d	Intention	Perceived Behavioural Control and Behaviour	Accepted	Accepted	Accepted
73	H18e	Intention	Perceived Self-Interest and Behaviour	Accepted	Accepted	Accepted
74	H18f	Intention	Subjective Norm and Adoption	Accepted	Accepted	Accepted
75	H18g	Intention	Perceived Behavioural Control and Adoption	Accepted	Accepted	Accepted
76	H18h	Intention	Perceived Self-Interest and Adoption	Accepted	Accepted	Accepted
77	H18i	Intention	Observability and Later Adoption	Accepted	Accepted	Accepted
78	H19a	Behaviour	Persuader Legitimacy and Continued Adoption	Accepted	Rejected (-)	Accepted
79	H19b	Behaviour	Perceived Urgency and Continued Adoption	Accepted	Accepted	Rejected
80	H19c	Behaviour	Consequences and Continued Adoption	Accepted	Accepted	Accepted
81	H20	Age	Attitude	Accepted	Insignificant	Insignificant
82	H20	Age	Intention	Insignificant	Insignificant	Insignificant
83	H20	Age	Adoption	Insignificant	Insignificant	Insignificant
84	H20	Age	Behaviour	Insignificant	Insignificant	Accepted
85	H20	Age	Continued Adoption	Insignificant	Insignificant	Insignificant
86	H20	Age	Later Adoption	Rejected (-)	Insignificant	Insignificant
87	H21	Work Experience	Attitude	Rejected (-)	Insignificant	Insignificant
88	H21	Work Experience	Intention	Insignificant	Insignificant	Insignificant
89	H21	Work Experience	Adoption	Insignificant	Insignificant	Insignificant
90	H21	Work Experience	Behaviour	Insignificant	Insignificant	Insignificant
91	H21	Work Experience	Continued Adoption	Insignificant	Insignificant	Insignificant
92	H21	Work Experience	Later Adoption	Insignificant	Insignificant	Insignificant

Table VIII - 4: Summary of Accepted and Rejected Hypotheses for Study I, Study II and Study III (Continuation)

No.	Hypothesis	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
93	H22	Level of Education	Attitude	Insignificant	Insignificant	Insignificant
94	H22	Level of Education	Intention	Insignificant	Insignificant	Insignificant
95	H22	Level of Education	Adoption	Insignificant	Insignificant	Insignificant
96	H22	Level of Education	Behaviour	Insignificant	Insignificant	Insignificant
97	H22	Level of Education	Continued Adoption	Insignificant	Insignificant	Insignificant
98	H22	Level of Education	Later Adoption	Insignificant	Rejected (-)	Insignificant
99	H23	Gender	Attitude	Insignificant	Insignificant	Insignificant
100	H23	Gender	Intention	Insignificant	Insignificant	Insignificant
101	H23	Gender	Adoption	Insignificant	Rejected (-)	Insignificant
102	H23	Gender	Behaviour	Insignificant	Accepted	Insignificant
103	H23	Gender	Continued Adoption	Insignificant	Rejected (-)	Insignificant
104	H23	Gender	Later Adoption	Insignificant	Insignificant	Insignificant
105	H24	Job Position	Attitude	Insignificant	Insignificant	Insignificant
106	H24	Job Position	Intention	Rejected (-)	Insignificant	Insignificant
107	H24	Job Position	Adoption	Insignificant	Insignificant	Insignificant
108	H24	Job Position	Behaviour	Insignificant	Insignificant	Insignificant
109	H24	Job Position	Continued Adoption	Insignificant	Accepted	Rejected (-)
110	H24	Job Position	Later Adoption	Insignificant	Insignificant	Insignificant
111	H25a	Innovative Behaviour	Attitude	Accepted	Accepted	Accepted
112	H25b	Innovative Behaviour	Intention	Accepted	Accepted	Accepted
113	H25c	Innovative Behaviour	Adoption	Accepted	Accepted	Accepted
114	H25d	Innovative Behaviour	Behaviour	Accepted	Accepted	Accepted
115	H25e	Innovative Behaviour	Rate of Diffusion	Accepted	Accepted	Accepted

Table VIII - 5: Summary of Accepted and Rejected Hypotheses for Study I, Study II and Study III (Continuation)

Structural Equation Modelling Paths	SEM (Study I)	SEM (Study II)	SEM (Study III)
Intention ← Attitude	Accepted	Accepted	Accepted
Intention ← Subjective Norm	Accepted	Accepted	Accepted
Intention ← Perceived Behavioural Control	Accepted	Accepted	Accepted
Behaviour ← Intention	Accepted	Accepted	Accepted
Behaviour ← Perceived Behavioural Control	Accepted	Accepted	Accepted

Table VIII - 6: Summary of SEM Results for Study I, Study II and Study III (Model #1)

Structural Equation Modelling Paths	SEM (Study I)	SEM (Study II)	SEM (Study III)
Attitude ← Knowledge	Accepted	Rejected	Rejected
Attitude ← Perceived Complexity	Rejected	Accepted	Rejected
Attitude ← Perceived Compatibility	Rejected	Accepted	Accepted
Attitude ← Perceived Relative Advantage	Accepted	Accepted	Accepted
Attitude ← Observability	Rejected	Rejected	Accepted
Attitude ← Trialability	Rejected	Accepted	Rejected
Intention ← Attitude	Rejected	Accepted	Accepted
Intention ← Perceived Relative Advantage	Accepted	Accepted	Accepted
Behaviour ← Intention	Accepted	Accepted	Accepted
Confirmation ← Behaviour	Accepted	Accepted	Accepted

Table VIII - 7: Summary of SEM Results for Study I, Study II and Study III (Model #2)

Structural Equation Modelling Paths	SEM (Study I)	SEM (Study II)	SEM (Study III)
Perceived Argument Quality ← Knowledge	Accepted	Accepted	Accepted
Perceived Source Credibility ← Knowledge	Accepted	Accepted	Accepted
Attitude ← Perceived Complexity	Accepted	Accepted	Rejected
Attitude ← Perceived Compatibility	Rejected	Accepted	Accepted
Attitude ← Perceived Relative Advantage	Accepted	Accepted	Accepted
Attitude ← Observability	Rejected	Rejected	Accepted
Attitude ← Trialability	Accepted	Accepted	Rejected
Attitude ← Perceived Argument Quality	Accepted	Rejected	Accepted
Attitude ← Perceived Source Credibility	Accepted	Accepted	Rejected
Attitude ← Perceived Risk	Rejected	Rejected	Accepted
Attitude ← Communicability	Accepted	Rejected	Accepted
Intention ← Attitude	Rejected	Rejected	Accepted
Intention ← Perceived Relative Advantage	Accepted	Accepted	Accepted
Intention ← Subjective Norm	Accepted	Accepted	Accepted
Intention ← Perceived Behavioural Control	Accepted	Accepted	Accepted
Intention ← Perceived Self Interest	Rejected	Rejected	Accepted
Behaviour ← Intention	Accepted	Accepted	Accepted
Behaviour ← Perceived Persuader Legitimacy	Accepted	Accepted	Accepted
Behaviour ← Perceived Urgency	Rejected	Rejected	Accepted
Behaviour ← Perceived Consequences	Rejected	Rejected	Rejected
Confirmation ← Behaviour	Accepted	Accepted	Accepted

Table VIII - 8: Summary of SEM Results for Study I, Study II and Study III (Model #3)

Chapter IX

Discussion

9.1 Introduction

This chapter discusses the findings of this study and demonstrates how the research's aim and objectives have been successfully achieved. This research study sought to develop, verify and validate a Sustainability Diffusion Model (SDM). It began with an in-depth review of sustainability implementation literature; innovation diffusion literature; and persuasive communication literature. It was found from the review that although sustainability research had become increasingly prominent in recent years, there was still a wide gap between what was known and what had been put into practice. Sustainability scholars have not yet sufficiently addressed this issue. In fact, the number of theoretically-grounded sustainability implementation models, theories and frameworks remains alarmingly insufficient despite the rapid growth in the number of empirical studies that investigate sustainability and the implications of its implementation.

9.2 Sustainability Diffusion Model (SDM)

This research produced a holistic sustainability diffusion model which was validated using the scenarios of three pro-sustainability behaviours, namely: duplex printing; sustainable computing; and sustainability mindset. The validation process did not only test the hypotheses that conceptualise the nature of the relationship(s) between different components but also tested the interdependencies and interconnectedness that exist between these components. This section discusses the outcomes of a 3-scenario validation process for each component.

9.2.1 Perceived Relative Advantage

Perceived relative advantage refers to the "ratio of expected benefits and the costs of adoption of an innovation" (Rogers, 2003: p. 233). This construct reflects the degree to which a particular innovation is perceived to be more advantageous than its precedent (Wejnert, 2002). It was hypothesised that:

- H1a: perceived relative advantage is positively related to employees' attitudes towards sustainability / new sustainability initiatives.
- H1b: perceived relative advantage is positively related to employees' intentions to adopt sustainability / new sustainability initiatives.
- H1c: perceived relative advantage is positively related to the diffusion rate of sustainability / new sustainability initiatives.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H1a and H1b were both confirmed in all scenarios. Perceived relative advantage was found to be positively related to employees' attitudes towards the adoption of duplex printing (B=0.330, t=4.524, p<0.01), sustainable computing (B=0.508, t=6.579, p<0.01) and a sustainability mindset (B=0.139, t=2.127, p=0.034). The relationship between the two constructs was strongest in the sustainable computing scenario whereby one unit increase in perceived relative advantage is found to lead to 0.508 units increase in employees' favourable attitude towards the adoption of sustainable computing behaviour.

Moreover, perceived relative advantage was also found to be positively related to employees' behavioural intention to embrace duplex printing (B=0.171, t=2.591, p=0.010), sustainable computing (B=0.841, t=6.923, p<0.001) and sustainability (B=0.254, t=3.429, p=0.001). Again, the relationship between the two constructs was strongest in the sustainable computing scenario whereby one unit increase in perceived relative advantage is found to lead to 0.841 units increase in employees' willingness to adopt sustainable computing behaviour.

H1c was only confirmed in scenario II (i.e. sustainable computing) and was completely rejected in scenario I (i.e. duplex printing) as shown in Table IX 1. In the 1st scenario, the relationship between perceived relative advantage and the diffusion rate of duplex printing was found to be negative (B=-0.250, t=-2.749, p=0.006): one unit increase in the perceived relative advantage leads to 0.250 units decrease in the rate of diffusion. This finding came as a surprise because it is well-established in the diffusion of innovation literature that the relationship between perceived relative advantage and the rate of diffusion is almost always positive (e.g. Franceschinis et al., 2017; Aizstrauta et al., 2015). There are several possibilities that could provide an explanation for the 'surprisingly' negative relationship between the two constructs. However, the most logical explanation stems from the fact that many UK universities encourage their staff to go paperless altogether instead of using duplex printing. This means that even though the participants consider duplex printing to be relatively advantageous when compared to single-sided printing, it is not perceived as the right step forward. The participants appear to believe that university staff should not use any form of printing, instead, they should go paperless and avoid printing altogether.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H1a	Perceived Relative Advantage	Attitude	Accepted	Accepted	Accepted
H1b	Perceived Relative Advantage	Intention	Accepted	Accepted	Accepted
H1c	Perceived Relative Advantage	Rate of Diffusion	Rejected (-)	Accepted	Insignificant

Table IX 1: Perceived Relative Advantage - Summary of Hypothesis-testing Results

Moreover, the relationship between perceived relative advantage and the diffusion rate of sustainable computing was found to be positive (B=0.754, t=3.753, p<0.01). In the third scenario, the relationship between the two constructs was statistically insignificant.

The nature of the relationship between perceived relative advantage on one side and employees' attitudes and behavioural intentions on the other side was examined further using Structural Equation Modelling (SEM). SEM was performed on 2 models and using 3 different data sets (i.e. 3 scenarios). In all 3 scenarios of 'Structural Model #2', perceived relative advantage was found to have a significant, positive impact on employees' attitudes towards the adoption of duplex printing (B= 3.115), sustainable computing (B= 0.992) and sustainability culture (B= 0.840). Similarly, in Structural Model #3, perceived relative advantage was also found to have a significant, positive impact on employees' attitudes towards the adoption of duplex printing (B=1.844) and sustainable computing (B=1.029) and a positive, but a less significant impact on sustainability culture (B=0.212)

Moreover, the SEM of 'Structural Model #2', also confirmed that perceived relative advantage has a significant, positive impact on employees' behavioural intention to adopt and/or embrace duplex printing (B= 0.250), sustainable computing (B= 1.667) and sustainability culture (B= 1.388). The relationship between the two constructs was much stronger in 'Structural Model #3' in all scenarios, namely: duplex printing (B= 1.301), sustainable computing (B= 2.034) and sustainability culture (B= 0.927).

In conclusion, the findings from the three separate investigations strongly support the assumptions that perceived relative advantage has a significant, positive impact on employees' attitudes towards pro-sustainability behaviours and on their behavioural intentions to adopt and/or embrace pro-sustainability innovations.

This study's findings are consistent with the findings of numerous other scholars who have studied the impact of perceived relative advantage on individuals' attitudes and behavioural intention such as Agag and El-Masry (2016) and Sin et al. (2016). Agag and El-Masry investigated how perceived relative advantage influence consumers' attitudes towards online travel communities and their intention to participate in these communities. They found that perceived relative advantage had a positive impact on attitude (B= 0.41, p < 0.001). However, the construct's impact on consumers' intentions to participate in online travel community was found to be insignificant (B= 0.00, p = 0.24). Similarly, Sin et al. (2016) investigated the factors that influence the adoption of E-commerce and found that perceived relative advantage had a positive impact on the participants' behavioural intentions (B= 0.570). Hsbollah and Idris

(2009) also investigated the adoption of e-learning at Universiti Utara Malaysia and found that relative advantage was associated positively with the participants' behavioural intentions to adopt e-learning as a teaching tool (B=0.74).

9.2.2 Perceived Compatibility

Compatibility refers to the "degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters" (Rogers, 2003: p. 15). It was hypothesised that:

- H2a: perceived compatibility is positively related to employees' attitudes towards sustainability / pro-sustainability behaviours.
- H2b: perceived compatibility is positively related to employees' intentions to adopt sustainability / pro-sustainability behaviours.
- H2c: perceived compatibility is positively related to the diffusion rate of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H2a and H2b were both confirmed in all scenarios. Perceived compatibility was found to be positively related to employees' attitudes towards the adoption of duplex printing (B=0.471, t=5.458, p<0.01), sustainable computing (B=0.274, t=3.993, p<0.01) and a sustainability mindset (B=0.373, t=5.068, p<0.001). The relationship between the two constructs was strongest in the duplex scenario whereby one unit increase in perceived compatibility is found to lead to 0.471 units increase in employees' favourable attitude towards the adoption of duplex printing. This is perhaps because university employees perceive double-sided printing to be consistent with their current needs and/or consider duplex printing to be compatible with the default settings of modern printers.

Moreover, perceived compatibility was also found to be positively related to employees' behavioural intention to embrace duplex printing (B=0.650, t=8.317, p<0.01), sustainable computing (B=0.294, t=2.706, p<0.007) and sustainability (B=0.298, t=3.559, p<0.001). Again, the relationship between the two constructs was strongest in the duplex printing scenario whereby one unit increase in perceived compatibility is found to lead to 0.650 units increase in employees' willingness to use duplex instead of single-sided printing.

H2c was also confirmed in scenario II (i.e. sustainable computing) and scenario III (i.e. sustainability mindset). The relationships between perceived compatibility and the diffusion rate of sustainable computing (B=0.475, t=2.898, p=0.004) and sustainability culture (B=0.521, t=4.092, p<0.001) were both found to be positive. However, it was completely

rejected in scenario I (i.e. duplex printing) as shown in Table IX 2. In the 1st scenario, the relationship between perceived compatibility and the diffusion rate of duplex printing was found to be negative (B=-0.325, t=-2.931, p=0.004)- one unit increase in the perceived compatibility leads to 0.325 units decrease in the rate of diffusion. This finding came as a surprise because it is well-established in the diffusion of innovation literature that the relationship between perceived compatibility and the rate of diffusion is almost always positive (e.g. Agag and El-Masry, 2016). As explained previously, many UK universities encourage their staff to go paperless altogether instead of using duplex printing. This means that even though the participants consider duplex printing to be compatible with their needs, it is not perceived as the right step forward.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H2a	Perceived Compatibility	Attitude	Accepted	Accepted	Accepted
H2b	Perceived Compatibility	Intention	Accepted	Accepted	Accepted
H2c	Perceived Compatibility	Diffusion Rate	Rejected (-)	Accepted	Accepted

Table IX 2: Perceived Compatibility - Summary of Hypothesis-testing Results

The nature of the relationship between perceived compatibility on one side and employees' attitudes and behavioural intentions on the other side was examined further using Structural Equation Modelling (SEM). SEM was performed on 2 models and using 3 different data sets (i.e. 3 scenarios). In all 3 scenarios of 'Structural Model #2', perceived compatibility was found to have a positive impact on employees' attitudes towards the adoption of sustainability culture (B= 0.343) and sustainable computing (B= 0.141), but a negative impact on the adoption of duplex printing (B= -1.140). Similarly, in Structural Model #3, perceived compatibility was also found to have a positive impact on employees' attitudes towards the adoption of sustainability culture (B= 0.408) and sustainable computing (B= 0.142), but a negative impact on workers' attitude towards duplex printing (B= -0.393).

Surprisingly, the SEM of 'Structural Model #2' and 'Structural Model #3' could not confirm the relationship between perceived compatibility and employees' behavioural intentions in all 3 scenarios, namely: duplex printing, sustainable computing and sustainability culture. The relationship between the two constructs was statistically insignificant ($p>0.05$) in all scenarios. It appears that the extent of influence 'perceived compatibility' has on individuals' adoption/rejection decisions is limited to attitude and it does not extend beyond the creation of a favourable or unfavourable perception of the innovation or behaviour. This could also mean that 'perceived compatibility' does not have a direct relationship with intention. Instead, the relationship between the two constructs is mediated by attitude.

In conclusion, the findings from the three separate investigations strongly support the assumptions that perceived compatibility has a positive impact on employees' attitudes towards pro-sustainability behaviours. Perceived compatibility was also found to have a positive impact on employees' behavioural intentions to adopt and/or embrace pro-sustainability innovations even though the relationship was structurally insignificant.

This study's findings are somewhat consistent with the findings of numerous other scholars who have studied the impact of perceived compatibility on individuals' attitudes and behavioural intention such as Agag and El-Masry (2016; p. 104). Agag and El-Masry investigated how perceived compatibility influence consumers' attitudes towards online travel communities and their intentions to participate in these communities. Their study found "significant positive impacts of compatibility on intention to participate ($B= 0.39$, $p < 0.001$) and attitude ($B= 0.56$, $p < 0.001$)".

9.2.3 Perceived Complexity

Complexity refers to "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003: p. 15). Complexity is considered an obstacle to innovations adoption. Hence, it was, hypothesised that:

- H3a: perceived complexity is negatively related to employees' attitudes towards sustainability / pro-sustainability behaviours.
- H3b: perceived complexity is negatively related to employees' intentions to adopt sustainability / pro-sustainability behaviours.
- H3c: perceived complexity is negatively related to the diffusion rate of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H3a was only accepted in scenario II (i.e. sustainable computing: $B=-0.109$, $t=-2.154$, $p=0.032$) and was completely rejected in scenario I (i.e. duplex printing: $B=0.156$, $t=2.230$, $p=0.026$). The relationship between perceived complexity and employees' attitudes was statistically insignificant in scenario III (i.e. sustainability mindset). Similarly, H3b was statistically insignificant in scenarios I and II. It was only accepted in scenario III ($B=-0.144$, $t=-2.241$, $p=0.026$). It appears that complexity has not been an issue for most of the participants. This is understandable considering that the use of duplex printing instead of single-sided printing as well as the sustainable use of personal computers is relatively easy. In other words, the three pro-sustainability behaviours investigated in this research were rather easy to adopt and/or embrace and hence complexity was not perceived as a hindrance.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H3a	Perceived Complexity	Attitude	Rejected (+)	Accepted	Insignificant
H3b	Perceived Complexity	Intention	Insignificant	Insignificant	Accepted
H3c	Perceived Complexity	Diffusion Rate	Insignificant	Insignificant	Insignificant

Table IX 3: Perceived Complexity - Summary of Hypothesis-testing Results

Although perceived complexity is generally believed to have a negative impact on individuals' behavioural intentions and attitudes towards the adoption of new innovations, there have been mixed conclusions about the significance of its impact. For example, Hsbollah and Idris, (2009) investigated the adoption of e-learning as a teaching tool by 244 lecturers in Universiti Utara Malaysia and found that some of the "variables introduced by Rogers (for example observability, complexity and compatibility) were questionable in terms of their validity as latent variables". Their study concluded that perceived complexity did not have a significant impact on lecturers' adoption decisions. However, their study investigated a single organisation; therefore, their conclusions were not necessarily generalisable.

On the other hand, Franceschinis et al. (2017) investigated the adoption of renewable heating technologies in Italy and found a negative correlation between perceived complexity and consumers' attitudes towards the adoption of such technologies. They divided the participants into three classes or segments; namely, Class 1 - early adopters (26.9%): B= -0.14; Class 2 - laggards (29.1%): B= -0.22; and Class 3 - intermediate (44.0%): B= -0.12. In all classes, the relationship between the two constructs was negative.

The findings of this study and the findings of other scholars lead us to believe that the extent to which 'perceived complexity' influences people's attitudes, behavioural intentions and adoption decisions is determined by whether the innovation is inherently easy or inherently complex. Perceived complexity has an insignificant and a negligible impact on the diffusion of easy-to-implement and easy-to-use innovations. Its impact is most significant when the innovation is characterised as complex, difficult-to-implement and hard-to-use.

9.2.4 Perceived Risk

Perceived risk refers to the probability or likelihood of an innovation's failure to meet the needs and expectations of the unit of adoption (Flight et al., 2011). This thesis conceptualised risk as an individual's perception of the possibility of generating negative results or suffering from the negative consequences of an innovation adoption failure. It argued that an innovation which has a high likelihood or probability of failure will diffuse at a much slower rate than an innovation with a lower probability of failure. Hence, it was hypothesised that:

- ❖ H4a: perceived risk is negatively related to employees' attitudes towards sustainability / pro-sustainability behaviours.
- ❖ H4b: perceived risk is negatively related to employees' intentions to adopt sustainability / pro-sustainability behaviours.
- ❖ H4c: perceived risk is negatively related to the diffusion rate of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H4a was only accepted in scenario III (i.e. sustainability culture) and was statistically insignificant in scenarios I and II (i.e. duplex printing and sustainable computing). In scenario III, the relationship between perceived risk and attitude was found to be negative (B=-0.214, t=-4.112, p<0.001) - one unit increase in perceived risk leads to 0.214 units decrease in attitude. In contrast, H4b was confirmed in all 3 scenarios. Perceived risk was found to have a negative impact on employees' behavioural intention to adopt duplex printing (B=-0.156, t=-2.837, p=0.005); sustainable computing (B=-0.165, t=-2.042, p=0.042); and a sustainability mindset (B=-0.154, t=-2.624, p=0.009). The negative relationship between the two constructs was strongest in the sustainable computing scenario whereby one unit increase in perceived risk is found to lead to 0.165 units decrease in employees' willingness to adopt sustainable computing. However, the coefficient values are relatively close to each other in all 3 scenarios which suggest there is not anything unique about sustainable computing that makes it riskier to adopt than duplex printing or sustainability mindset. Instead, this could mean that perceived risk is generally seen as a hindrance to the adoption of new behaviours.

Moreover, H4c was confirmed in scenarios I and III and the relationship between perceived risk and the diffusion rate of sustainable computing was found to be statistically insignificant in scenario II as shown in Table IX 4. In the 1st scenario, the relationship between perceived risk and the diffusion rate of duplex printing was found to be negative (B=-0.236, t=-3.053, p=0.002) - one unit increase in the perceived risk to 0.236 units decrease in the diffusion rate of duplex printing. The relationship between the two constructs was also negative in scenario III (B=-0.238, t=-2.576, p=0.010) - a one unit increase in perceived risk leads to 0.238 units decrease in the diffusion rate of a sustainability culture.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H4a	Perceived Risk	Attitude	Insignificant	Insignificant	Accepted
H4b	Perceived Risk	Intention	Accepted	Accepted	Accepted
H4c	Perceived Risk	Diffusion Rate	Accepted	Insignificant	Accepted

Table IX 4: Perceived Risk - Summary of Hypothesis-testing Results

The nature of the relationship between perceived risk on one side and employees' attitudes and behavioural intentions on the other side was examined further using Structural Equation Modelling (SEM). SEM was performed on 2 models and using 3 different data sets (i.e. 3 scenarios). There was an insignificant difference between the outcomes of the hypothesis-testing process and the results of SEM in all of the scenarios.

There are not many studies in the literature that investigated the impact of perceived risk on the diffusion of innovations, but the closest empirical study was that of Franceschinis et al. (2017) who investigated the adoption of renewable heating technologies. Their study divided the participants into three segments; namely, early adopters, laggards and intermediate adopters. Perceived risk was also divided into two sub-categories; namely, performance risk and social risk. They found that both categories of perceived risk have a negative impact on consumers' attitudes towards the adoption of renewable heating technologies. Performance risk was negatively related to consumers' attitudes in all three segments: early adopters (B= -0.04); laggards (B= -0.31); and intermediate (B=-0.23). However, social performance was negatively related to consumers' attitude in two out of the three segments, namely: laggards (B= -0.09) and intermediate (B= -0.05).

9.2.5 Trialability

Trialability refers to the "degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 16). Triability helps to reduce uncertainties or any complexities that might be associated with the innovation, which will, in turn, result in a favourable attitude towards its adoption. Hence, it was hypothesised that:

- H5a: trialability is positively related to employees' attitudes towards sustainability / pro-sustainability behaviours.
- H5b: trialability is positively related to employees' intentions to adopt sustainability / pro-sustainability behaviours.
- H5c: trialability is positively related to the diffusion rate of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H5a and H5b were both found to be statistically insignificant in all 3 scenarios as shown in Table IX 5. It appears that the participants do not perceive 'trialability' to have any impact on their attitudes or behavioural intentions to adopt or reject the pro-sustainability behaviours under investigation. The fact that the pro-sustainability behaviours investigated in this thesis are easy to adopt and operationalise also explains why 'trialability' has an insignificant impact on

employees' attitudes and behavioural intentions. The employees did not need to trial duplex printing, sustainable computing or the sustainability mindset to realise their benefits and potential implications. Their benefits and implications are obvious and intuitive.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H5a	Trialability	Attitude	Insignificant	Insignificant	Insignificant
H5b	Trialability	Intention	Insignificant	Insignificant	Insignificant
H5c	Trialability	Rate of Diffusion	Insignificant	Accepted	Insignificant

Table IX 5: Trialability - Summary of Hypothesis-testing Results

Moreover, H5c was also found to be statistically insignificant in scenarios I and III. This hypothesis was only confirmed in scenario II whereby the trialability of sustainable computing was found to relate positively to the diffusion rate of the behaviour (B=0.283, t=2.178, p=0.030) - one unit increase in trialability leads to 0.283 units increase in diffusion rate.

This study's results are contrary to the general argument found in the diffusion of innovation literature. It is generally believed that trialability is positively related to attitude, intention and the rate of diffusion. For example, Hsbollah and Idris, (2009) studied the adoption of e-learning by lecturers in Universiti Utara Malaysia and found that trialability has a significant, positive impact on lecturers' adoption decisions (B = 0.596; p> 0.000). They concluded that an "increase of one unit in trialability is associated with an increase in the odds log of e-learning adoption by 0.596". A similar study by Martins et al. (2004) also concluded that trialability was one of the most significant determinants of adoption of the internet as a teaching tool.

However, a study by Franceschinis et al. (2016) found that the relationship between trialability and individuals' willingness to decide in favour of adopting a new innovation was not always positive. Their investigation into the diffusion of heating renewable technologies in Italy trialability had a positive impact on consumers' adoption decisions, especially among 'laggards' (B= 0.11). However, the relationship between trialability and adoption decisions was found to be negative in the case of innovators/early adopters (B= -0.04). They explained that early adopters or innovators often did not trial and they were always the first to adopt new products. They were adventurous and that is why trialability had an insignificant or a negative impact on their adoption decisions.

9.2.6 Observability

Observability refers to the "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 16). Observability helps to initiate a domino effect which facilitates for the diffusion of the innovation to the 'early majority' of adopters. It also has a huge impact

on the attitudes of 'late adopters' who tend to take much longer time observing a particular innovation before making a decision on whether to adopt it or reject it (Hsu et al., 2007). Hence, it was hypothesised that:

- H6a: observability is positively related to employees' attitudes towards sustainability / pro-sustainability behaviours.
- H6b: observability is positively related to employees' intentions to adopt sustainability / pro-sustainability behaviours.
- H6c: observability is positively related to the diffusion rate of sustainability / pro-sustainability behaviours.
- H6d: observability is positively related to later adoption of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H6a and H6b were not accepted in scenarios I and II, but the two hypotheses were confirmed in scenario III as shown in Table IX 6. It was found that the observability of sustainable workplace behaviours and practices is positively related to employees' attitudes towards the adoption of a sustainability mindset ($B=0.190$, $t=3.889$, $p<0.01$). One unit increase in observability was found to lead to 0.190 units increase in favourable attitude towards adoption of sustainability. It was also found that observability has a positive impact on employees' behavioural intention to behave sustainably at work ($B=0.126$, $t=2.283$, $p=0.023$).

Moreover, H6c was not confirmed in any of the scenarios. In fact, it was rejected entirely in scenario I. The relationship between observability and the diffusion rate of duplex printing was found to be negative ($B=-0.204$, $t=-2.217$, $p=0.027$). The analysis shows that a one unit increase in observability leads to 0.204 units decrease in diffusion rate of duplex printing. Although observability is generally seen to have a positive relationship with the diffusion rate of innovations, it was not surprising to find that the relationship between the two constructs is negative in case of duplex printing. As discussed previously, many of employees appear to believe that duplex printing should not be adopted and the idea of a 'paperless' workplace should be diffused in universities instead.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H6a	Observability	Attitude	Insignificant	Insignificant	Accepted
H6b	Observability	Intention	Insignificant	Insignificant	Accepted
H6c	Observability	Rate of Diffusion	Rejected (-)	Insignificant	Insignificant
H6d	Observability	Later Adoption	Insignificant	Insignificant	Insignificant

Table IX 6: Observability - Summary of Hypothesis-testing Results

Furthermore, the relationship between observability and later adoption was also found to be statistically insignificant in all scenarios. This does not mean that observability does not have any impact on the adoption decisions of late adopters. Instead, it means that the participants do not derive much of their motivation to adopt pro-sustainability behaviours from others. In other words, they do not do it because others do it; instead, they do it because they personally believe it is the right thing to do.

This study's findings contradict the work of several innovation diffusion scholars such as Rogers (2003) whose work confirms the positive relationship between observability and individuals' willingness to decide in favour of the adoption of new innovations. A more recent study by Flight et al. (2011) investigated how the characteristics of an innovation influence the pattern of its adoption. The study found that observability had a significant, positive impact on individuals' adoption decisions (B= 0.59).

9.2.7 Communicability

Communicability refers to the degree to which an innovation can be mass-communicated to potential adopters (Flight et al., 2011). The communicability of an innovation facilitates for mass-adoption as information about the characteristics of the innovation (i.e. compatibility and relative advantage) is easily communicated, shared and transferred amongst potential adopters (Tornatzky and Klein, 1982). Hence, it was, hypothesised that:

- H7a: communicability is positively related to employees' attitudes towards sustainability / pro-sustainability behaviours.
- H7b: communicability is positively related to employees' intentions to adopt sustainability / pro-sustainability behaviours.
- H7c: communicability is positively related to the diffusion rate of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H7a, H7b and H7c were all accepted in scenario I (i.e. duplex printing), but they were statistically insignificant in scenario II (i.e. sustainable computing) as shown in Table IX 7. In the 1st scenario, it was found that communicability is positively related to employees' attitudes towards the adoption of duplex printing (B=0.158, t=2.111, p=0.035); to employees' behavioural intention to adopt and actualise duplex printing (B=0.194, t=2.867, p=0.004); and to the rate by which duplex printing is diffused in the participants' organisations (B=0.256, t=2.663, p=0.008). The most significant relationship was between communicability and the

rate of diffusion. A one unit increase in communicability was found to result in 0.256 units increase in diffusion rate of duplex printing.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H7a	Communicability	Attitude	Accepted	Insignificant	Accepted
H7b	Communicability	Intention	Accepted	Insignificant	Accepted
H7c	Communicability	Diffusion Rate	Accepted	Insignificant	Insignificant

Table IX 7: Communicability - Summary of Hypothesis-testing Results

The relationship between communicability on the one hand and attitude and behavioural intention, on the other hand, was also confirmed in the 3rd scenario. Communicability was found to have a positive impact on employees' attitudes towards the adoption of sustainability (B=0.116, t=2.051, p=0.041). The analyses suggest that one unit increase in communicability leads to 0.116 units increase in attitude. Communicability was also found to have a positive impact on employees' behavioural intentions (B=0.133, t=2.065, p=0.040). The results indicate that one unit increase in communicability leads to 0.133 units increase in employees' intention to embrace sustainability. However, even though communicability was found to have a positive impact on employees' attitudes and behavioural intentions, its relationship with the diffusion rate of sustainability was statistically insignificant.

Surprisingly, communicability does not appear to play any significant role in shaping the attitudes and behavioural intentions of Study II's participants. The characteristics of the workplace might have something to do with it. Study I and Study III both targeted the employees of UK universities, whereas Study II targeted any person who uses a computer at work. Universities are often characterised as large organisations in which internal communication plays a significant role in keeping employees up-to-date with new policies, procedures and initiatives. In such an environment, mass-communication of the universities' intentions to implement new, pro-sustainability initiatives is not only perceived as "news", but it is also seen as an invitation to participate in the implementation process. That's probably why communicability is perceived by the participants of Study I and Study III was crucial in shaping their attitudes and behavioural intentions. In contrast, employees who work in smaller, less communication-oriented office environments might perceive the information they receive about pro-sustainability initiatives "good-to-know" facts rather than as an encouragement to embrace and adopt the new initiatives.

There are not many empirical studies in the literature which investigate the nature of the relationship between an innovation's communicability on the one hand and attitude, behavioural intention and rate of diffusion on the other hand. No studies were found to

investigate the construct in the context of pro-sustainability behaviours. The most relevant investigation was that of Flight et al. (2011). Flight et al. investigated how the characteristics of consumer products influenced the pattern of their diffusion. They argued that the communicability of an innovation had an indirect, positive relationship with adoption. They claimed that the impact of communicability on consumers' adoption decisions was mediated by the "information construct". In other words, the communicability of the innovation helped consumers to become much more familiar with the innovation's compatibility and relative advantages which in turn helped to create a favourable attitude towards its adoption.

9.2.8 Knowledge: Perceived Source Credibility

Beaulieu (2001: p. 85) defined source credibility as the quality that determines "whether sources of information inspire belief in their representations". Sources that are perceived to be competent and unbiased are taken much more seriously and are listened to far more attentively than those who lack credibility. This thesis argued that perceived source credibility does not necessarily have a direct impact on individuals' attitudes towards sustainability innovations or their intentions to adopt or reject a particular sustainability initiative. Instead, it moderates the relationship between knowledge and attitude. It was hypothesised that:

- H8a: perceived source credibility positively moderates the relationship between sustainability-related knowledge and employees' attitudes towards sustainability / pro-sustainability behaviours.
- H8b: perceived source credibility positively moderates the relationship between sustainability-related knowledge and the diffusion rate of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). Both H8a and H8b were found to be statistically insignificant. There are two possible reasons for these results. Firstly, the participants do not perceive the person or the source from whom they heard about the particular pro-sustainability behaviours to be an expert or trustworthy. Secondly, the participants reject the idea of having to be persuaded by an expert or a trustworthy source and consider the adoption of the behaviours under investigation to be totally intuitive and that individuals are naturally inclined towards their adoption.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H8a	Knowledge	Attitude	Insignificant	Insignificant	Insignificant
H8b	Knowledge	Diffusion Rate	Insignificant	Insignificant	Insignificant

Table IX 8: Perceived Source Credibility - Summary of Hypothesis-testing Results

Unfortunately, no studies were found in the academic literature to investigation the moderation effect of 'perceived source credibility' or even study the nature of the relationship between knowledge and the diffusion rate of pro-sustainability behaviours. The closest study was that of Cai et al. (2017). Their study examined the impact of the perceived credibility of eco-labels on the behavioural intentions of green consumers. Using a sample from 124 Chinese cities, they found that higher levels of perceived credibility were associated with higher behavioural intention to purchase green products. Their findings, therefore, confirmed the importance of 'source credibility' in the process of persuasion. Another study by Ngamvichaikit and Beise-Zee (2014) examined the moderation effect of service provider credibility on customers' purchase decisions and level of satisfaction. They found that perceived source credibility moderated the relationship between knowledge and customers' purchase decisions.

However, Kim and Damhorst (1999) examined the impact of ad message credibility on consumers' environmental attitude and found that the moderation effect of the perceived credibility of environmental messages was statistically insignificant. Using a sample of 274 undergraduate students, they found that the participants' response to different environmental messages remained almost unchanged despite the changes in the source of the message.

9.2.9 Knowledge: Perceived Argument Quality

Argument quality refers to "the persuasive strength of arguments embedded in an informational message" (Bhattacherjee and Sanford, 2006, p. 811). It is the extent to which message receivers consider the argument convincing in defending its position. This thesis argued that perceived argument quality moderates the relationship between knowledge and attitude. It was hypothesised that:

- H9a: perceived argument quality positively moderates the relationship between sustainability-related knowledge and employees' attitudes towards sustainability / pro-sustainability behaviours.
- H9b: perceived argument quality positively moderates the relationship between sustainability-related knowledge and the diffusion rate of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H9a was found to be statistically insignificant in all 3 scenarios. It appears that perceived argument quality does not moderate the relationship between pro-sustainability knowledge and the participants' attitudes towards the adoption of duplex printing, sustainable computing and towards embracing a sustainability mindset in the workplace. In contrast, H9b was confirmed

in scenarios I and III. In scenario I, perceived argument quality positively moderated the relationship between knowledge and the rate by which duplex printing is diffused (B=0.243, t=2.854, p=0.005) and interaction between knowledge and perceived argument quality (B=0.267, t=2.772, p=0.006). In consequence, the influence of knowledge depends on the level of the perceived argument quality: one unit increase in knowledge leads to an increase in diffusion rate with (0.243+0.267 * Perceived Argument Quality) units. The moderation effect, however, was statistically insignificant in the sustainable computing scenario.

In scenario III, perceived argument quality positively moderated the relationship between knowledge and the rate by which sustainability culture is diffused (B=0.308, t=2.783, p=0.006) and interaction between knowledge and perceived argument quality (B=-0.299, t=-2.889, p=0.004). This means that the influence of knowledge depends on the level of the perceived argument quality: one unit change in knowledge leads to a change in diffusion rate with (0.308-0.299 * Perceived Argument Quality) units.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H9a	Knowledge	Attitude	Insignificant	Insignificant	Insignificant
H9b	Knowledge	Diffusion Rate	Accepted	Insignificant	Accepted

Table IX 9: Perceived Argument Quality - Summary of Hypothesis-testing Results

There are not any studies in the literature that examine how the relationship between pro-sustainability knowledge and people's attitude towards the adoption of pro-sustainability behaviours and the rate by which these behaviours are diffused. Therefore, this study is among very few studies, if not the only study, that examines the moderation effect of 'argument quality' on the diffusion rate of pro-sustainability behaviours. A not so relevant study by Marcotte and Bourdeau (2012) examined how eco-labels can be used as a promotional argument for sustainable tourism by Destination Marketing Organizations (DMOs). They found that although eco-labels could be used to boost promotional arguments and as a means of diffusing sustainable tourism practices, they were rarely employed by DMOs.

9.2.10 Subjective Norm

Subjective norm refers to "one's perceptions or assumptions about others' expectations of certain behaviours that one will or will not perform" (Huda et al., 2012; p. 272). This thesis argued that people's attitudes toward a particular pro-sustainability behaviour and their intentions to perform that behaviour are influenced by their perceptions of social pressure, be it in favour or against that behaviour. It was hypothesised that:

- H10a: a pro-sustainability subjective norm is positively related to employees' attitudes towards sustainability / new sustainability behaviours.

- ❖ H10b: a pro-sustainability subjective norm is positively related to employees' intentions to adopt sustainability / new sustainability behaviours.
- ❖ H10c: a pro-sustainability subjective norm is positively related to the diffusion rate of sustainability / new sustainability behaviours.
- ❖ H10d: pro-sustainability subjective norm has a positive, indirect effect on sustainability actualisation (through behavioural intention).
- ❖ H10e: pro-sustainability subjective norm has a positive, indirect influence on employees' willingness to decide in favour of sustainability adoption (through behavioural intention).

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H10a was only confirmed in scenario II. The relationship between subjective norm and attitude was found to be statistically insignificant in scenarios I and II. In scenario II, subjective norm was found to correlate positively with employees' attitudes towards the adoption of sustainable computing ($B=0.156$, $t=4.228$, $p<0.01$) - one unit increase in the subjective norm leads to 0.156 units increase in favourable attitude. This could mean that the participants of Study II feel that their colleagues or their superiors expect them to engage in a sustainable computing behaviour whenever possible. It could also mean that the participants engage in the behaviour not because they think it is the right thing to do, but rather because it is expected of them. In contrast, the participants of Study I and Study III engage in the behaviour because they believe it is the right thing to do and not necessarily because they feel obliged to.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H10a	Subjective Norm	Attitude	Insignificant	Accepted	Insignificant
H10b	Subjective Norm	Intention	Accepted	Accepted	Insignificant
H10c	Subjective Norm	Diffusion Rate	Insignificant	Insignificant	Insignificant
H10d	Subjective Norm	Behaviour	Accepted	Accepted	Accepted
H10e	Subjective Norm	Adoption	Insignificant	Accepted	Accepted

Table IX 10: Subjective Norm - Summary of Hypothesis-testing Results

As shown in Table IX 10, H10b was confirmed only in scenarios I and II, but it was statistically insignificant in scenario III. In scenario I, subjective norm was found to relate positively to employees behavioural intention to adopt duplex printing ($B=0.106$, $t=3.092$, $p=0.002$) - a one unit increase in the subjective norm leads to 0.106 units increase in employees' behavioural intention to use duplex instead of single-sided printing. Similarly, the relationship between the two constructs was significantly positive in the 2nd scenario ($B=0.339$, $t=5.794$, $p<0.001$) - one unit increase in the subjective norm leads to 0.339 units increase in employees' behavioural intention to embrace sustainable computing. Subjective norm appears to have a greater impact on behavioural intention in the case of sustainable computing than in

the case of duplex printing. This result is understandable because not every workplace encourages duplex printing. There are organisations which encourage employees to avoid printing altogether. In contrast, almost every workplace expects employees to engage in a sustainable computing behaviour. That's probably why the influence of subjective norm on behavioural intention is much more significant in the scenario or sustainable computing.

Surprisingly, H10c was statistically insignificant in all 3 scenarios. This result comes as a surprise because of the general assumption that if the subjective norm is positively related to attitude or behavioural intention, it should correlate positively with the behaviour and the rate by which that behaviour is diffused. However, just because the relationship between the two constructs is statistically insignificant, it does not mean that the two variables are not correlated at all. It could mean that the relationship is indirect, or is moderated by other variables.

H10d was confirmed in all of the 3 scenarios. In Study I, subjective norm and the actualisation of duplex printing correlated positively ($B=0.164$, $t=4.124$, $p<0.01$). A one unit increase in subjective norm was found to lead to 0.164 units increase in the use of duplex instead of single-sided printing at UK universities. The relationship between the two constructs was of greater significance in Study II ($B=0.218$, $t=3.196$, $p=0.002$) than in Study I and Study III. A one unit increase in subjective norm leads to 0.218 units increase the actualisation of sustainable computing behaviours. In Study III, subjective norm appears to have a less significant influence on the diffusion of sustainability mindset than it does on the diffusion of sustainable computing ($B=0.183$, $t=4.083$, $p<0.001$).

Lastly, H10e was accepted in scenarios II and III, but was statistically insignificant in scenario I. However, the relationship between subjective norm and the adoption of duplex printing in scenario I was "close to significant" ($B=0.378$, Exp (B) $=1.460$, $p=0.055$). It was found that subjects with high levels of subjective norm have 146% more chances (on average) to adopt duplex printing compared to the subjects with low levels of subjective norm. In scenario II, the relationship between the two constructs was significantly positive ($B=0.727$, $Exp(B)=2.069$, $p<0.01$). It was found that subjects with high subjective norm have 206% more chances to adopt the sustainable computing compared to the subjects with low subjective norm. The relationship was slightly less significant in scenario III ($B=0.546$, $Exp(B)=1.726$, $p=0.029$). It appears that employees who work in an environment with high levels of pro-sustainability subjective norm have 172% more chances to embrace a sustainability mindset compared to employees who work in an environment with low levels of pro-sustainability subjective norm.

The nature of the relationship between subjective norm on one side and employees' attitudes, behavioural intentions, behaviour and adoption on the other side was examined further using Structural Equation Modelling (SEM). SEM was performed on 2 models and using 3 different data sets (i.e. 3 scenarios). In all 3 scenarios of 'Structural Model #1', subjective norm was found to have a positive impact on employees' behavioural intention to adopt duplex printing (B= 0.277), sustainable computing (B= 0.380) and sustainability culture (B= 0.087). However, subjective norm's structural relationship with the other constructs was statistically insignificant. Similarly, in Structural Model #3, subjective norm was also found to have a positive impact only on employees' behavioural intention to adopt duplex printing (B=0.067) and sustainable computing (B=0.272) and a positive, but a less significant impact on sustainability culture (B=0.018).

There are numerous studies in the literature which investigate the relationship between subjective norms on the one hand and behavioural intention and pro-environmental behaviours on the other hand. However, there are not many studies that investigate the relationship between subjective norm and attitude or the rate of diffusion. Additionally, there are not any studies that examine the nature of the relationship between subjective norm and adoption as a pre-behaviour construct. Many studies utilise the theory of planned behaviour to study the impact of subjective norm on behavioural intention and the actualisation of pro-environmental behaviours. For example, Goh et al. (2017) used the theory of planned behaviour to study non-compliance in national parks. Their study found that subjective norm was the "strongest predictor of visitor non-compliant behaviour at national parks" (p. 124). Examination of the statistics of subjective norm (â = 0.212, $p < 0.01$) showed â weights which indicated that subjective norm was a significant predictor of non-compliant behavioural intentions.

Han (2015) combined the theory of planned behaviour with the theory of value-belief-norm in order to study the factors that influence travellers' pro-environmental behaviour. Their investigation found a positive relationship between subjective norm and behavioural intention (β= 0.201, $p < 0.01$). Their findings, therefore, are consistent with the findings of this thesis. However, they did not examine the relationship between subjective norm and attitude. Instead, they studied the relationship between attitude and intention (β= 0.275, $p < 0.01$).

Joshi and Rahman (2017) also investigated the impact of subjective norm on consumers' sustainable purchase behaviour. Their study of 750 young consumers in Delhi found that subjective norm was the second most significant predictor of sustainable purchase behaviour (ß = 0.32, $p < 0.0001$). This was followed by attitude (ß = 0.30, $p< 0.0001$). However, although their findings are consistent with the findings of this thesis, they do not conceptualise

attitude as a dependent variable. Instead, both attitude and subjective norm are conceptualised as independent variables of behaviour.

9.2.11 Perceived Behavioural Control

Perceived behavioural control refers to an individual's beliefs concerning the availability of resources, skills and capabilities to perform a particular behaviour (Ajzen, 1991). It was hypothesised that:

- H11a: perceived behavioural control is positively related to employees' attitudes towards sustainability / pro-sustainability behaviours.
- H11b: perceived behavioural control is positively related to employees' intentions to adopt sustainability / pro-sustainability behaviours.
- H11c: perceived behavioural control is positively related to the diffusion rate of sustainability / pro-sustainability behaviours.
- H11d: perceived behavioural control has a positive, indirect effect on sustainability actualisation (through behavioural intention).
- H11e: perceived behavioural control has a positive, indirect influence on an employee's willingness to decide in favour of sustainability adoption (via behavioural intention).

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H11a was confirmed in scenarios I and III, but it was statistically insignificant in scenario II. In Study I, perceived behavioural control correlated positively with employees' attitudes towards the adoption of duplex printing ($B=0.164$, $t=3.696$, $p<0.01$). It was found that a one unit increase in perceived behavioural control leads to 0.164 units increase in favourable attitude towards the adoption of duplex printing. Similarly, in Study III, perceived behavioural control was found to be positively related to employees attitude towards the adoption of a sustainability mindset ($B=0.107$, $t=2.142$, $p=0.033$). A one unit increase in perceived behavioural control was found to lead to 0.107 units increase in favourable attitude towards the adoption of a sustainability culture.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H11a	Behavioural Control	Attitude	Accepted	Insignificant	Accepted
H11b	Behavioural Control	Intention	Accepted	Accepted	Insignificant
H11c	Behavioural Control	Diffusion Rate	Insignificant	Accepted	Insignificant
H11d	Behavioural Control	Behaviour	Accepted	Accepted	Accepted
H11e	Behavioural Control	Adoption	Accepted	Accepted	Accepted

Table IX 11: Perceived Behavioural Control - Summary of Hypothesis-testing Results

H11b was confirmed in scenarios I and II, but it was statistically insignificant in scenario III. The relationship between perceived behavioural control and employees' behavioural intention to adopt duplex printing correlated positively in Study I (B=0.121, t=3.026, p=0.003). A one unit increase in the perceived behavioural control leads to 0.121 units increase in behavioural intention to adopt duplex printing. Similarly, in scenario II, it was found that one unit increase in the perceived behavioural control leads to 0.153 units increase in employees' intention to adopt sustainable computing (B=0.153, t=2.138, p=0.033).

Surprisingly, H11c was only confirmed in scenario II. The relationship between perceived behavioural control and diffusion rate was statistically insignificant in scenarios I and III. In Study II, the relationship between the two constructs was positive - one unit increase in the perceived behavioural control leads to 0.373 units increase in the rate by which sustainable computing behaviours are diffused (B=0.373, t=3.292, p=0.001).

H11d was confirmed in all of the 3 studies. In scenario I, a one unit increase in the perceived behavioural control was found to lead to 0.384 units increase in the actualisation of the duplex printing behaviour (B=0.384, t=9.886, p<0.01). In scenario II, it was found that a one unit increase in the perceived behavioural control leads to 0.477 units increase in the actualisation of the sustainable computing behaviour (B=0.477, t=4.006, p<0.01). In scenario III, it was found that one unit increase in perceived behavioural control leads to 0.418 units increase in the actualisation of sustainability in the workplace (B=0.418, t=7.562, p<0.001). The relationship between the two constructs was most significant in the sustainable computing scenario which indicates that employees' perceptions of their ability to operationalise the sustainable computing habits, behaviours or practices have a significant influence not only on their willingness to engage in the diffusion of these behaviours or practices but also on their commitment to the actualisation of these behaviours.

H11e was also confirmed in all of the 3 scenarios. In Study I, it was found employees with high perceived behavioural control have 192% more chances to adopt duplex printing compared to employees with low perceived behavioural control (B=0.654, Exp(B)=1.924, p<0.01). The relationship between the two constructs was even more significant in Study II. It was found that employees with high perceived behavioural control have 325% more chances to adopt the sustainable computing compared to the employees with low perceived behavioural control (B=1.180, Exp(B)=3.256, p<0.01). The relationship was even more significant in Study III where it was found that subjects with high perceived behavioural control have 352% more chances to adopt sustainability compared to the subjects with low perceived behavioural control (B=1.181, Exp(B)=3.526, p<0.001).

The nature of the relationship between perceived behavioural on one side and employees' behavioural intentions on the other side was examined further using Structural Equation Modelling (SEM). SEM was performed on 2 models and using 3 different data sets (i.e. 3 scenarios). In all 3 scenarios of 'Structural Model #1', perceived behavioural control was found to have a positive impact on employees' behavioural intention to adopt duplex printing (B= 0.276), sustainable computing (B= 0.243) and sustainability culture (B=0.177). The relationship between the two constructs was also positive in all scenarios of 'Structural Model #3' even though it was not as significant as in Model #1. In Model #3, perceived behavioural control appears to have a positive influence on employees' behavioural intention to adopt duplex printing (B= 0.145), sustainable computing (B= 0.036) and sustainability culture (B=0.094). This confirms that the impact of perceived behavioural control on the adoption and actualisation of pro-sustainability behaviours does pass through the construct of "intention".

9.2.12 Perceived Self Interest

Self-interest is defined as the short-to-medium term impact of an issue (e.g. a decision to adopt sustainability) on the material well-being of the individual's personal life (Sears and Funk, 1990). This thesis argued people are more likely to embrace pro-sustainability initiatives if they perceive the initiatives to guard/boost their self-interest and/or increase their personal gain. It was hypothesised that:

- H12a: a favourable perception of self-interest is positively related to employees' attitudes towards sustainability / pro-sustainability behaviours.
- H12b: a favourable perception of self-interest is positively related to employees' intentions to adopt sustainability / pro-sustainability behaviours.
- H12c: a favourable perception of self-interest is positively related to the diffusion rate of sustainability / pro-sustainability behaviours.
- H12d: a favourable perception of self-interest has a positive, indirect effect on sustainability actualisation (through behavioural intention).
- H12e: a favourable perception of self-interest has a positive, indirect influence on an employee's willingness to decide in favour of sustainability adoption (through behavioural intention).

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H12a, H12c and H12e were all found to be statistically insignificant in all of the 3 studies as shown in Table IX 12. H12b and H12d were also found to be statistically insignificant in scenarios I and II. The positive relationship between perceived self-interest and intention was only confirmed in scenario III. In Study III, it was found that one unit increase in perceived

self-interest leads to 0.110 units increase in employees' intention to embrace sustainability (B=0.110, t=2.287, p=0.023). The relationship between perceived self-interest and behaviour was also only confirmed in scenario III. It was found that one unit increase in perceived self-interest leads to 0.174 units increase in the actualisation of sustainability in the workplace (B=0.174, t=2.871, p=0.004).

Generally, perceived self-interest appears to have a negligible impact on the diffusion process of pro-sustainability behaviours.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H12a	Perceived Self-Interest	Attitude	Insignificant	Insignificant	Insignificant
H12b	Perceived Self-Interest	Intention	Insignificant	Insignificant	Accepted
H12c	Perceived Self-Interest	Diffusion Rate	Insignificant	Insignificant	Insignificant
H12d	Perceived Self-Interest	Behaviour	Insignificant	Insignificant	Accepted
H12e	Perceived Self-Interest	Adoption	Insignificant	Insignificant	Insignificant

Table IX 12: Perceived Self Interest - Summary of Hypothesis-testing Results

9.2.13 Perceived Consequences

Consequence, as a term, is defined as; a result or effect which is unwelcome or unpleasant (Moscovitch et al., 2012). This thesis argued that influencing individuals' beliefs about the consequences of performing a particular behaviour produces changes in their attitude toward that behaviour. It was hypothesised that:

- H13a: perceived consequences are positively related to the diffusion rate of sustainability / pro-sustainability behaviours.
- H13b: perceived consequences are positively related to the actualisation of sustainability / pro-sustainability behaviours.
- H13c: perceived consequences have a positive influence on an employee's willingness to decide in favour of sustainability adoption.
- H13d: perceived consequences are positively related to continued adoption of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). Surprisingly, all of the hypothesised relationships were found to be statistically insignificant in all the scenarios as shown in Table IX 13. This means that perceived consequences have a negligible impact on the diffusion process of pro-sustainability behaviours. The participants in all of the 3 studies seem to believe that their decisions to adopt the investigated pro-sustainability behaviours were not motivated by fear of consequences. They probably believe

that their motivation was derived from sources other than fear of consequences such as subjective norm; perception of relative advantages; and personal values.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H13a	Perceived Consequences	Rate of Diffusion	Insignificant	Insignificant	Insignificant
H13b	Perceived Consequences	Behaviour	Insignificant	Insignificant	Insignificant
H13c	Perceived Consequences	Adoption	Insignificant	Insignificant	Insignificant
H13d	Perceived Consequences	Continued Adoption	Insignificant	Insignificant	Insignificant

Table IX 13: Perceived Consequences - Summary of Hypothesis-testing Results

9.2.14 Perceived Urgency of Change

Urgency means "of pressing importance" (Kotter, 2013; p. 7). When people have a true sense of urgency, they think that action on critical issues is needed now, not eventually, not when it fits easily into a schedule (Kotter, 2008). This thesis argued that diffusion urgency helps to generate social pressure within an organisation, which in turn increases an employee's willingness to engage in a particular pro-sustainability behaviour. It was, therefore, hypothesised that:

- H14a: perceived urgency is positively related to the diffusion rate of sustainability / pro-sustainability behaviours.
- H14b: perceived urgency is positively related to the actualisation of sustainability / pro-sustainability behaviours.
- H14c: perceived urgency has a positive influence on an employee's willingness to decide in favour of sustainability adoption.
- H14d: perceived urgency is positively related to continued adoption of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H14a was found to be statistically insignificant in all 3 scenarios as shown in Table IX 14. This result came as a surprise considering that the relationship between perceived urgency and the actualisation of pro-sustainability behaviours was positive in all 3 studies. In Study I, it was found that one unit increase in perceived urgency leads to 0.318 units increase in the actualisation of duplex printing in the workplace ($B=0.318$, $t=5.752$, $p<0.01$). The relationship was much stronger in Study II. It was found that one unit increase in the perceived urgency leads to 0.481 units increase in the actualisation of sustainable computing ($B=0.481$, $t=4.226$, $p<0.01$). This could mean that the participants perceive 'sustainable computing' to be a much more urgent behaviour than duplex printing. It could also the result of a perception among some participants that all forms of printing should be avoided whenever is possible.

The diffusion of sustainability culture was also perceived to be less urgent than the diffusion of sustainable computing. The results of Study III indicate that one unit increase in perceived urgency leads to 0.229 units increase in the actualisation of sustainability in the workplace (B=0.229, t=3.255, p=0.001).

H4c was also found to be statistically insignificant in all 3 scenarios. It appears that 'perceived urgency' has a significant impact on the actualisation of the pro-sustainability behaviour, but not on the adoption decision. This perhaps explains why the relationship between perceived urgency and 'continued adoption' was only accepted in scenario II, but not in the 1st and 3rd scenarios. In scenario II, it was found that employees with high levels of perceived urgency have 175% more chances (on average) to adopt the sustainable computing compared to the employees with low levels of perceived urgency (B=0.562, Exp(B)=1.754, p=0.056). This could mean that although perceived urgency does have some level of influence on employees' adoption and continued adoption decisions, the influence is not always significant. It has a much greater influence on the actualisation of the pro-sustainability behaviour itself.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H14a	Perceived Urgency	Rate of Diffusion	Insignificant	Insignificant	Insignificant
H14b	Perceived Urgency	Behaviour	Accepted	Accepted	Accepted
H14c	Perceived Urgency	Adoption	Insignificant	Insignificant	Insignificant
H14d	Perceived Urgency	Continued Adoption	Insignificant	Accepted	Insignificant

Table IX 14: Perceived Urgency - Summary of Hypothesis-testing Results

9.2.15 Perceived Persuader Legitimacy

Legitimacy is "the power which stems from internalised values which dictate that [an individual or an organisation] has a legitimate right to influence a person and that the person has an obligation to accept this influence" (French and Raven, 1959; p. 159). This thesis argued that individuals are more likely to be persuaded of the need for sustainability by a person whom they perceive to have the legitimacy to persuade them than a person with a low level of legitimacy. It was, therefore, hypothesised that:

- H15a: perceived persuader legitimacy is positively related to the diffusion rate of sustainability / pro-sustainability behaviours.
- H15b: perceived persuader legitimacy is positively related to the actualisation of sustainability / pro-sustainability behaviours.
- H15c: perceived persuader legitimacy has a positive influence on an employee's willingness to decide in favour of sustainability adoption.

- ❖ H15d: perceived persuader legitimacy is positively related to continued adoption of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H15a was completely rejected in scenarios I and II. The relationship between perceived persuader legitimacy and the rate by which duplex printing and sustainable computing behaviours are diffused turned out to be negative. In Study I, it was found that a one unit increase in the perceived persuader legitimacy leads to 0.174 units decrease in diffusion rate of duplex printing (B=-0.174, t=-2.658, p=0.008). Similarly, in Study II, one unit increase in the perceived persuader legitimacy was found to lead to 0.282 units decrease in diffusion rate of sustainable computing (B=-0.282, t=-2.259, p=0.025). These findings suggest that the participants of Study I and II strongly believe that their superiors have not contributed in any way to their decisions to adopt and embrace the investigated behaviours.

H15b was only accepted in scenario II, while H15c and H15d were found to be statistically insignificant in all 3 scenarios as shown in Table IX 15. In scenario II, it was found that one unit increase in the perceived persuader legitimacy leads to 0.199 units increase in the actualisation of the sustainable computing behaviour (B=0.199, t=2.231, p=0.027). Despite this specific finding, it is safe to say that people's perceptions of 'persuader legitimacy' have an insignificant and almost negligible impact on the diffusion of pro-sustainability behaviours.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H15a	Persuader Legitimacy	Rate of Diffusion	Rejected (-)	Rejected (-)	Insignificant
H15b	Persuader Legitimacy	Behaviour	Insignificant	Accepted	Insignificant
H15c	Persuader Legitimacy	Adoption	Insignificant	Insignificant	Insignificant
H15d	Persuader Legitimacy	Continued Adoption	Insignificant	Insignificant	Insignificant

Table IX 15: Perceived Persuader Legitimacy - Summary of Hypothesis-testing Results

9.2.16 Knowledge

The first step in the sustainability diffusion process is concerned with the transfer of knowledge between the persuaders and the persuadees. This thesis argued that the transfer of sustainability knowledge amongst employees is inversely related to perceived risk and complexity of sustainability adoption. It was, therefore, hypothesised that:

- ❖ H16a: knowledge is positively related to employees' attitudes towards sustainability / pro-sustainability behaviours.
- ❖ H16b: the relationship between knowledge and employees' attitudes towards sustainability / pro-sustainability behaviours is moderated by argument quality.

- ❖ H16c: the relationship between knowledge and employees' attitudes towards pro-sustainability behaviours is moderated by perceived source credibility.
- ❖ H16d: knowledge has a positive, indirect influence on employees' intentions to adopt sustainability / pro-sustainability behaviours.
- ❖ H16e: knowledge is positively related to the diffusion rate of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). Surprisingly, H16a was found to be statistically insignificant in scenarios I and II and was entirely rejected in scenario III. In Study III, it was found that a one unit increase in knowledge leads to 0.130 units decrease in employees' attitudes towards the adoption of sustainability (B=-0.130, t=-2.099, p=0.037). This result comes as a surprise because increased knowledge of sustainability is often associated with an improved attitude towards the adoption and operationalisation of pro-sustainability behaviours. This finding suggests that the participants have a strongly favourable attitude towards the diffusion of sustainability despite having been exposed to an insignificant level of pro-sustainability knowledge. This is probably the only way to explain the negative relationship between the two constructs.

H16b and H16c were both statistically insignificant in all 3 scenarios and H16d and H16e were only accepted in scenario I (*See* Table IX 16). In Study I, the relationship between knowledge and the rate by which duplex printing is diffused was found to be positive (B=0.243, t=2.854, p=0.005). The interaction between knowledge and perceived argument quality was also positive (B=0.267, t=2.772, p=0.006). Consequently, the influence of knowledge depends on the level of perceived argument quality: one unit increase in knowledge leads to an increase in diffusion rate with (0.243+0.267 * Perceived Argument Quality) units.

	Independent Variable	**Dependent Variable**	**Study I Results**	**Study II Results**	**Study III Results**
H16a	Knowledge	Attitude	Insignificant	Insignificant	Rejected (-)
H16b	Knowledge	Attitude (Argued Quality)	Insignificant	Insignificant	Insignificant
H16c	Knowledge	Attitude (Moderated by Source Credibility)	Insignificant	Insignificant	Insignificant
H16d	Knowledge	Intention	Accepted	Insignificant	Insignificant
H16e	Knowledge	Diffusion Rate	Accepted	Insignificant	Insignificant

Table IX 16: Knowledge - Summary of Hypothesis-testing Results

9.2.17 Attitude (Persuasion)

Attitude is defined by Černoušková (1988: p. 5) as "mental dispositions expressing evaluative relationship; which means that they are lasting systems of positive or negative evaluations, feelings and tendencies of acting towards people, objects of the external world as well as towards ourselves". It was hypothesised that:

- H17a: attitude is positively related to employees' behavioural intentions to embrace sustainability / pro-sustainability behaviours.
- H17b: attitude mediates the relationship between knowledge and employees' behavioural intentions to embrace sustainability / pro-sustainability behaviours.
- H17c: attitude mediates the relationship between perceived relative advantage and employees' intentions to embrace sustainability / pro-sustainability behaviours.
- H17d: attitude mediates the relationship between perceived compatibility and employees' intentions to embrace sustainability / pro-sustainability behaviours.
- H17e: attitude mediates the relationship between perceived complexity and employees' behavioural intentions to embrace sustainability / pro-sustainability behaviours.
- H17f: attitude mediates the relationship between perceived risk and employees' behavioural intentions to embrace sustainability / pro-sustainability behaviours.
- H17g: attitude mediates the relationship between observability and employees' behavioural intentions to embrace sustainability / pro-sustainability behaviours.
- H17h: attitude mediates the relationship between communicability and employees' behavioural intentions to embrace sustainability / pro-sustainability behaviours.
- H17i: attitude mediates the relationship between trialability and employees' behavioural intentions to embrace sustainability / pro-sustainability behaviours.
- H17j: attitude mediates the relationship between observability and later adoption/continued rejection of sustainability / pro-sustainability behaviours

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). All of the hypotheses were confirmed in scenario I. All the mediation effects were found to be statistically significant ($p<0.05$). The strongest mediation effect appears between trialability and employees' behavioural intention to adopt duplex printing (35.7% of the total effect). Two relationships are negative, namely: perceived complexity – intention; and perceived risk – intention. The other relationships are positive. More details about the mediation effects analysis can be found in Chapter VIII, Table VIII 23.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H17a	Attitude	Intention	Accepted	Rejected (-)	Accepted
H17b	Attitude	Knowledge and Intention	Accepted	Accepted	Accepted
H17c	Attitude	R. Advantage and Intention	Accepted	Accepted	Accepted
H17d	Attitude	Compatibility and Intention	Accepted	Accepted	Accepted
H17e	Attitude	Complexity and Intention	Accepted	Accepted	Accepted
H17f	Attitude	Risk and Intention	Accepted	Accepted	Accepted
H17g	Attitude	Observability and Intention	Accepted	Accepted	Accepted
H17h	Attitude	Communicability and Intention	Accepted	Accepted	Accepted
H17i	Attitude	Trialability and Intention	Accepted	Accepted	Accepted
H17j	Attitude	Observability and L. Adoption	Accepted	Accepted	Accepted

Table IX 17: Mediation Effects of Attitude - Summary of Hypothesis-testing Results

In Study II, all the mediation effects were found to be statistically significant ($p<0.001$), but the direct relationship between attitude and employees' behavioural intention to adopt sustainable computing was found to be slightly negative. On the other hand, the proportion due to mediation for the path Trialability → Attitude → Intention indicates that there is no direct relationship between trialability and intention (the intention is totally explained by the attitude). The strongest mediation effect appears between perceived complexity and intention (75% of the total effect). More detailed results are available in Chapter VIII, Table VIII 56.

All of the hypotheses were also confirmed in scenario III. All the mediation effects are statistically significant ($p<0.05$) and are medium sized. The strongest mediation effect was found to be between perceived risk and intention (54% of the total effect) as well as between trialability and intention (53%). Details results can be found in Chapter VIII, Table VIII 101.

The mediation effect of attitude between observability as an independent variable and later adoption, as a dependent variable was also confirmed in all 3 scenarios. In scenario I, the mediation effect was found to be statistically significant ($p<0.05$). Attitude accounted for 19.4% of the total effect. In the 2nd scenario, the mediation effect was found to be very strong (78%), suggesting that the later adoption is mostly influenced by attitude. However, in the 3rd scenario, attitude accounted for only 19% of the mediation effect. More details of mediation effects of attitude can be found in Chapter VIII: Table VIII 27; VIII 60; and VIII 105.

The abovementioned findings are relatively unique in the sense that there are not many, if any at all, studies that investigate the mediation effect of attitude on the relationship between knowledge, relative advantage, compatibility, risk, observability, communicability and trialability on the one hand and on behavioural intention on the other hand. Also, there are not any studies that investigate the mediation of effect of attitude on the relationship between

observability and later adoption. However, there are hundreds of studies that examine the relationship between attitude and behavioural intention in the context of the environment.

The majority of studies that investigate the impact of attitude on pro-environmental behaviour use the theory of planned behaviour as a theoretical foundation. For example, Mancha and Yoder (2015) used the theory of planned behaviour to examine how attitude predicts green behavioural. Their investigation found that the "path between preservation attitude and green behavioural intention was 0.39 and highly significant ($t = 4.36$, $p < 0.0001$)" and they concluded that attitude towards the environment was the most predictive variable of people's behavioural intentions to take part in pro-environmental actions.

Another study by Goh, et al. (2017) also used the theory of planned behaviour to explore the variables that influence visitors' intentions to venture off-trail at the Blue Mountains National Park, Australia. Their analysis of 325 survey responses revealed that the visitors' attitude, subjective norm and perceived behavioural control combined together explained 14.8 per cent of the variance in visitors' behavioural intention to venture off-trail ($p < 0.01$). However, subjective norm ($\hat{a} = 0.212$, $p < 0.01$) and not the attitude ($\hat{a} = 0.180$, $p < 0.01$) was found to be the strongest predictor of visitors' behavioural intention.

Generally, the relationship between attitude and behavioural intention is directional and is almost always positive. However, there are a few, rare, instances where the relationship between the two constructs might turn out to be negative as was the case in Study II of this thesis. In the 2nd scenario, the relationship between employees' attitudes towards sustainable computing and their behavioural intention to adopt the behaviour was slightly negative. Although this finding goes contrary to the general assumption in the behaviour management literature, it is somewhat consistent with the findings of Alcock et al. (2017). Alcock et al. investigated whether people's pro-environmental attitudes determine their air travel behaviour. They found that having pro-environmental attitudes did not deter people from engaging in environmentally unfriendly behaviours such as; frequent, long-distance air travel.

Ertz et al. (2016) also explored the nature of the relationship between attitude and the pro-environmental behaviours of consumers. Their investigation included a number of contextual variables and attempted to analyse the mediation effect of attitude on the relationship between these variables and behaviour. They found that attitude had a significant, positive influence on individuals' willingness to perform pro-environmental behaviours (Attitude → behaviour; B 0.982***). They also concluded that the context-attitude relationship was significant which indicated that the relationship between the contextual variables and behaviour was indirect and

was mostly mediated by attitude. In contrast, Vainio and Paloniemi (2014) found that the relationship between attitude and pro-environmental behaviour was indirect.

Moreover, in their investigation into pro-environmental consumption in Nordic countries, Vainio and Paloniemi (2014) used the system justification theory to help examine the impact of attitude on pro-environmental consumption among the adult population. They concluded that the relationship between attitude and sustainable consumption behaviour was indirect and was mediated by knowledge and environmental concern. They explained that although the relationship between the two constructs was commonly positive, the nature of the relationship was far more complex than what was generally believed.

9.2.18 Behavioural Intention (Pre-Decision)

Ajzen (1991) argued that the "immediate antecedent of any behaviour is the intention to perform the behaviour". People are expected to do what they intend to do, to behave in accordance with their intentions. Intentions capture the motivational forces that influence behaviour; the stronger the intention, the more likely the performance of the behaviour (Yadav and Pathak, 2016). It was, therefore, hypothesised that:

- H18a: behavioural intention is positively related to an employee's willingness to decide in favour of sustainability / pro-sustainability behaviours' adoption.
- H18b: behavioural intention is positively related to the actualisation of sustainable behaviours / pro-sustainability behaviours.
- H18c: behavioural intention mediates the relationship between subjective norm and the actualisation of sustainable behaviours / pro-sustainability behaviours.
- H18d: behavioural intention mediates the relationship between perceived behavioural control and the actualisation of sustainable behaviours / pro-sustainability behaviours.
- H18e: behavioural intention mediates the relationship between perceived self-interest and the actualisation of sustainable behaviours / pro-sustainability behaviours.
- H18f: behavioural intention mediates the relationship between subjective norm and employees' decisions with regards to the adoption/rejection of sustainability / pro-sustainability behaviours.
- H18g: behavioural intention mediates the relationship between perceived behavioural control and employees' decisions with regards to the adoption/rejection of sustainability / pro-sustainability behaviours.
- H18h: behavioural intention mediates the relationship between perceived self-interest and employees' decisions with regards to the adoption/rejection of sustainability / pro-sustainability behaviours.

- ❖ H18i: behavioural intention mediates the relationship between observability and later adoption/continued rejection of sustainability / pro-sustainability behaviours.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). All of the hypotheses were confirmed in all scenarios except H18a and H18b. H18a was found to be statistically insignificant in scenarios I and II, while H18b was statistically insignificant only in scenario II as shown in Table IX 18.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H18a	Intention	Adoption	Insig.	Insig.	Accepted
H18b	Intention	Behaviour	Accepted	Insig.	Accepted
H18c	Intention	Subjective Norm and Behaviour	Accepted	Accepted	Accepted
H18d	Intention	P. Behavioural Control and Behaviour	Accepted	Accepted	Accepted
H18e	Intention	P. Self-Interest and Behaviour	Accepted	Accepted	Accepted
H18f	Intention	Subjective Norm and Adoption	Accepted	Accepted	Accepted
H18g	Intention	P. Behavioural Control and Adoption	Accepted	Accepted	Accepted
H18h	Intention	P. Self-Interest and Adoption	Accepted	Accepted	Accepted
H18i	Intention	Observability and Later Adoption	Accepted	Accepted	Accepted

Table IX 18: Mediation Effects of Intention - Summary of Hypothesis-testing Results

In Study I (i.e. duplex printing), structural equation modelling (SEM) was performed on 3 models, namely: theory of planned behaviour, innovation-decision process model and the proposed sustainability diffusion model. The SEM of Model #1 showed that the relationship between employees' intention to adopt duplex printing and the actualisation of the behaviour is statistically significant (B= 0.750, Beta= 0.749, $p<0.01$). The regression coefficients suggest that a one unit increase in employees' behavioural intention leads to 0.750 units increase in the use of double-sided printing. The relationship between the two constructs was much more significant in Model #2 (B= 7.609, Beta= 0.994, $p<0.01$). The SEM of Model #2 revealed that intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 7.609 units increase in behaviour). The relationship was again significant in Model #3 (B= 1.023, Beta= 0.933, $p<0.01$), but not as significant as it was in Model #2. The SEM of Model #3 also showed that intention has a significant, positive impact on the behaviour.

Moreover, the mediation effects of intention between subjective norm (H18c); perceived behavioural control (H18d); and perceived self-interest (H18e) on the one hand and the behaviour, on the other hand, was thoroughly examined. All the mediation effects were found to be positive and statistically significant ($p<0.01$) as seen in Table IX 19. Very strong mediation effects appeared between perceived self-interest and behaviour, on the one hand (82.1% of the total effect) and subjective norm and behaviour, on the other hand (75% effect).

Path	p value	Proportion due to mediation
Subjective Norm → Intention → Behaviour	<0.01	75.0%
Perceived Behavioural Control → Intention → Behaviour	<0.01	48.5%
Perceived Self Interest → Intention → Behaviour	<0.01	82.1%

Table IX 19: Mediation Effects of Intention on Behaviour - Study I

Furthermore, the mediation effects of intention between subjective norm (H18f); perceived behavioural control (H18g); and perceived self-interest (H18h) on the one hand and adoption, on the other hand, was also thoroughly examined. All the mediation effects were found to be positive and statistically significant ($p<0.01$) as seen in Table IX 20. The strongest mediation effect appears between perceived self-interest and adoption (49.8% of the total effect).

Path	p value	Proportion due to mediation
Subjective Norm → Intention → Adoption	<0.01	45.9%
Perceived Behavioural Control → Intention → Adoption	<0.01	31.7%
Perceived Self Interest → Intention → Adoption	<0.01	49.8%

Table IX 20: Mediation Effects of Intention on Adoption - Study I

Lastly, mediation effect of intention between observability as an independent variable and later adoption of duplex printing, as a dependent variable were thoroughly evaluated. The mediation effects were found to be positive and statistically significant ($p<0.01$) as shown in Table IX 21. The results of the analysis show that there is very strong mediation effect between observability and later adoption (45.3% of the total effect).

Path	p value	Proportion due to mediation
Observability → Intention → Later Adoption	<0.01	45.3%

Table IX 21: Mediation Effects of Intention on Later Adoption - Study I

In Study II (i.e. sustainable computing), H18a and H18b were found to be statistically insignificant. This came as a total surprise since the significant and positive relationship between behavioural intention and behaviour have been confirmed by numerous empirical studies (e.g. Borges et al., 2016; Halder et al., 2016). It appears that most of the participants of Study II did not pass through the pre-decision stage of the diffusion process. Instead, they moved directly from having a favourable attitude towards sustainable computing to the adoption and actualisation of the behaviour. This is not common, but it does happen especially in behaviours which can be characterised as "intuitively instinctive".

Moreover, structural equation modelling (SEM) was performed on 3 models, namely: theory of planned behaviour, innovation-decision process model and the proposed sustainability diffusion model. The SEM of Model #1 showed that the relationship between employees'

intention to adopt sustainable computing and the actualisation of the behaviour is statistically significant (B= 0.781, Beta= 0.739, p<0.01). The regression coefficients suggest that a one unit increase in employees' behavioural intention leads to 0.781 units increase in the use of sustainable computing. The relationship between the two constructs was slightly more significant in Model #2 (B= 0.947, Beta= 0.889, p<0.01). The SEM of Model #2 revealed that intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 0.947 units increase in behaviour). The SEM of Model #3 produced, somewhat, similar results (B= 0.966, Beta= 0.906, p<0.01) - one unit increase in intention leads to 0.966 units increase in behaviour.

The mediation effects of intention between subjective norm (H18c); perceived behavioural control (H18d); and perceived self-interest (H18e) on the one hand and the behaviour, on the other hand, was thoroughly examined. All the mediation effects were found to be positive and statistically significant (p<0.01) as seen in Table IX 22. Very strong mediation effects appeared between perceived self-interest and behaviour, on the one hand (97% of the total effect) and subjective norm and behaviour, on the other hand (96% of the total effect).

Path	p value	Proportion due to mediation
Subjective norm → Intention → Behaviour	<0.001	96%
Perceived behavioural control → Intention → Behaviour	<0.001	68%
Perceived self interest → Intention → Behaviour	<0.001	97%

Table IX 22: Mediation Effects of Intention on Behaviour - Study II

Furthermore, the mediation effects of intention between subjective norm (H18f); perceived behavioural control (H18g); and perceived self-interest (H18h) on the one hand and adoption on the other hand was also thoroughly examined. All the mediation effects were found to be positive and statistically significant (p<0.01) as seen in Table IX 23. The strongest mediation effect appears between perceived self-interest and adoption (63% of the total effect).

Path	p value	Proportion due to mediation
Subjective Norm → Intention → Adoption	<0.001	48%
Perceived Behavioural Control → Intention → Adoption	<0.001	22%
Perceived Self Interest → Intention → Adoption	<0.001	63%

Table IX 23: Mediation Effects of Intention on Adoption - Study II

Lastly, the mediation effect of intention between observability as an independent variable and later adoption of sustainable computing as a dependent variable was examined. The mediation effect was found to be positive and statistically significant (p<0.01) as shown in Table IX 24. The results of the analysis show that there is very strong mediation effect between observability and later adoption (73% of the total effect).

Path	p value	Proportion due to mediation
Observability → Intention → Later adoption	<0.001	73%

Table IX 24: Mediation Effects of Intention on Later Adoption - Study II

In Study III (i.e. sustainability mindset), all of the hypotheses were accepted. Again, structural equation modelling (SEM) was performed on 3 models, namely: theory of planned behaviour, innovation-decision process model and the proposed sustainability diffusion model. The SEM of Model #1 showed that the relationship between employees' intention to adopt sustainable computing and the actualisation of the behaviour is statistically significant (B= 0.784, Beta= 0.652, $p<0.001$). The regression coefficients suggest that a one unit increase in employees' behavioural intention leads to 0.784 units increase in the actualisation of the sustainability culture. The relationship between the two constructs was much more significant in Model #2 (B= 1.071, Beta= 0.878, $p<0.01$). The SEM of Model #2 revealed that intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 1.071 units increase in the actualisation of sustainability). The SEM of Model #3 produced, somewhat, similar results (B= 1.003, Beta= 0.829, $p<0.001$) - one unit increase in intention leads to 1.003 units increase in behaviour.

Moreover, the mediation effects of intention between subjective norm (H18c); perceived behavioural control (H18d); and perceived self-interest (H18e) on the one hand and the behaviour, on the other hand, was thoroughly examined. All the mediation effects were found to be positive and statistically significant ($p<0.01$) as seen in Table IX 25. A very strong mediation effect appears between perceived self-interest and behaviour (73% of the total effect). In conclusion, the variable intention seems to have a big effect on behaviour, almost suppressing the effects of perceived self-interest.

Path	p value	Proportion due to mediation
Subjective Norm → Intention → Behaviour	<0.001	58%
Perceived Behavioural Control → Intention → Behaviour	<0.001	50%
Perceived Self Interest → Intention → Behaviour	<0.001	73%

Table IX 25: Mediation Effects of Intention on Behaviour - Study III

Furthermore, the mediation effects of intention between subjective norm (H18f); perceived behavioural control (H18g); and perceived self-interest (H18h) on the one hand and adoption, on the other hand, was also thoroughly examined. All the mediation effects were found to be positive and statistically significant ($p<0.01$), but they are low in size as seen in Table IX 26. The strongest mediation effect appears between perceived self-interest and adoption (34% of the total effect).

Path	p value	Proportion due to mediation
Subjective Norm → Intention → Adoption	<0.001	20%
Perceived Behavioural Control → Intention → Adoption	<0.001	13%
Perceived Self Interest → Intention → Adoption	<0.001	34%

Table IX 26: Mediation Effects of Intention on Adoption - Study III

Lastly, the mediation effect of intention between observability as an independent variable and later adoption of sustainable computing as a dependent variable was examined. The mediation effect was found to be positive and statistically significant ($p<0.01$) as shown in Table IX 27. The results of the analysis show that there is a strong mediation effect between observability and later adoption (45% of the total effect).

Path	p value	Proportion due to mediation
Observability → Intention → Later Adoption	0.005	45%

Table IX 27: Mediation Effects of Intention on Later Adoption - Study III

The aforementioned findings are mostly consistent with the findings of other behavioural management scholars especially in relation to the mediation effects of behavioural intention between subjective norm and perceived behavioural control on the one hand and the behaviour on the other hand. However, no empirical investigations were found to examine the mediation effects of intention between perceived self-interest and behaviour; or between perceived self-interest and adoption; or between perceived self-interest and later adoption.

Greaves et al. (2013) explored the impact of intention on pro-environmental behaviour in the workplace. They used the theory of planned behaviour as a basis for their investigation. Their study examined employees' behavioural intentions across three different scenarios, one of which was using video-conferencing instead of travelling for meetings. They found that behavioural intention mediated the relationship between perceived behavioural control ($B = 0.11$; $CI = 0.04, 0.19$; $p < .01$); subjective norms ($B = 0.31$; $CI = 0.23, 0.40$; $p < .001$); and attitudes ($B = 0.29$; $CI = 0.17, 0.41$; $p < .001$) on the one hand and the behaviour itself on the other hand. The significance of the mediation effects was somewhat similar to that of Study I of this thesis (i.e. diffusion of duplex printing).

Tan et al. (2017) studied the variables that influence Malaysian consumers' intentions to purchase energy-efficient household appliances. They extended and tested the theory of planned behaviour in an environmental context. Unlike in Greaves et al. (2013), Tan et al. (2017) did not examine the mediation effect of intention on behaviour. Instead, they explored how attitude, subjective norm and perceived behavioural control influence people's behavioural intentions. They concluded that only attitude ($\beta=0.153$, $p<0.01$) and perceived

behavioural control (β=0.356, p<0.01), had a positive impact on consumers' purchase intentions. Surprisingly, their study found that the relationship between subjective norm and purchase intention was negative (β=−0.001, p>0.05). This is contrary to the findings of Study I and Study II of this thesis. Both studies found that the relationship between the two constructs is positive. More importantly, the SEM analysis revealed that the relationship between subjective norm and intention is positive and that intention mediates the relationship between subjective norm and the actualisation of pro-environmental behaviours.

In a more relevant study, Echegaray and Hansstein (2017) investigated the intention-behaviour gap. They examined the variables that influence people's behavioural intentions to recycle electronic waste in Brazil. They found that people generally had a favourable attitude towards e-waste recycling, particularly middle-aged female. However, social norm ($\beta = 0.35$, $p < 0.001$) and perceived behavioural control ($\beta = 0.16$, $p < 0.001$) were found to have a much more significant influence on the subjects' behavioural intentions than attitude. In fact, their study found that perceived control and subjective norm increased the likelihood that the pro-environmental behaviour was actualised, whereas attitude was found to have an insignificant impact on the actualisation of the e-waste recycling behaviour. Their findings, therefore, are consistent with the findings of this thesis as subjective norm and perceived behavioural control were found to correlate not only with behavioural intention but also with the behaviour itself.

9.2.19 Adoption/Rejection (Decision)

At the decision stage, an individual makes a choice on whether to adopt or reject a particular innovation (Rogers, 2003). It is at this stage that the decision-making unit, be it a manager or an employee, decides on whether to adopt or reject a particular pro-sustainability behaviour. Although this stage is very important for understanding sustainability diffusion, it is rather difficult to study. This is because the adoption decision occurs silently and invisibly and it is very difficult to capture the exact moment of the decision. This research was not interested in the timing of a decision but was rather interested in the factors that push the individual to decide in favour or against the adoption of pro-sustainability behaviours. Some of these factors have already been discussed in the previous sections, namely: perceived persuader legitimacy; perceived urgency; perceived consequences; subjective norm; perceived behavioural control; and perceived self-interest.

In all 3 studies, perceived behavioural control was found to have a significant, positive impact on an employee's willingness to decide in favour of the adoption of pro-sustainability behaviours. In the 1st scenario, it was found that employees with high perceived behavioural control have 192% more chances to adopt duplex printing compared to the subjects with low

perceived behavioural control (B=0.654, Exp(B)=1.924, p<0.01). The relationship was much more significant in the 2nd scenario. The analysis revealed that employees with high perceived behavioural control have 325% more chances to adopt the sustainable computing compared to the subjects with low perceived behavioural control (B=1.180, Exp(B)=3.256, p<0.01). In the 3rd scenario, the relationship was even more significant. It was found that employees with high perceived behavioural control have 352% more chances to adopt sustainability compared to the subjects with low perceived behavioural control (B=1.181, Exp(B)=3.526, p<0.001).

Moreover, subjective norm was also found to influence adoption/rejection decisions. However, its impact was statistically insignificant in Study I, though close to significant (p<0.10). The analysis revealed that subjects with high levels of subjective norm have 146% more chances (on average) to adopt duplex printing compared to the subjects with low levels of subjective norm (B=0.378, Exp(B)=1.460, p=0.055). In Study II, the results showed that employees with high subjective norm have 206% more chances to adopt the sustainable computing compared to the subjects with low subjective norm (B=0.727, Exp(B)=2.069, p<0.01). In the 3rd scenario, it was found that employees working in an environment with high levels of pro-sustainability subjective norm have 172% more chances (on average) to adopt sustainability compared to employees who work in an environment with low levels of pro-sustainability subjective norm (B=0.546, Exp(B)=1.726, p=0.029).

9.2.20 Behaviour (Actualisation)

The actualisation of pro-sustainability initiatives or behaviours often involves the modification, elimination or replacement of old routines, be it behavioural, organisational or operational, with new, higher order routines. Higher order routines refer to organisational practices that provide guidance and direction for the selection of new routines (Driel and Dolfsma, 2009). The existence of higher order routines in a firm's initial conditions increases its capacity to diffuse new innovations. In other words, organisations that already have higher order routines or a culture that promotes innovative behaviours and continuous search for excellence prior to the implementation of sustainability are more likely to avoid some of the organisational implications of sustainability diffusion (e.g. resistance to change) than their counterparts with a culture that promotes standardisation and institutionalisation of routines.

This thesis argued that in order for an employee to fully embrace or actualise a pro-sustainability behaviour, they need to be convinced that: (1) the person who encourages them to embrace the behaviour has a legitimate right to do so; (2) the actualisation of the behaviour is urgent and is significantly important; (3) and that there could be serious consequences if the behaviour is not actualised. It was hypothesised that:

- ❖ H19a: behaviour mediates the relationship between perceived persuader legitimacy and continued adoption of sustainability / new sustainability initiatives.
- ❖ H19b: behaviour mediates the relationship between perceived urgency and continued adoption of sustainability / new sustainability initiatives.
- ❖ H19c: behaviour mediates the relationship between perceived consequences and continued adoption of sustainability / new sustainability initiatives.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). H19a was accepted in scenario I (i.e. duplex printing) and scenario III (i.e. sustainability mindset), but it was completely rejected in scenario II as shown in Table IX 28. In contrast, H19b was accepted in scenarios I and II, but it was rejected in scenario III. H19c was only rejected in scenario I.

	Independent Variable	Dependent Variable	Study I Results	Study II Results	Study III Results
H19a	Behaviour	Persuader Legitimacy and Continued Adoption	Accepted	Rejected (-)	Accepted
H19b	Behaviour	Perceived Urgency and Continued Adoption	Accepted	Accepted	Rejected (-)
H19c	Behaviour	Perceived Consequences and Continued Adoption	Rejected (-)	Accepted	Accepted

Table IX 28: Mediation Effects of Intention - Summary of Hypothesis-testing Results

The mediation effects of behaviour between perceived persuader legitimacy (H19a); perceived urgency (H19b); and perceived consequences (H19c) on the one hand and continued adoption, on the other hand, was examined in 3 different scenarios. In Study I, all the mediation effects are statistically significant ($p<0.05$). However, the proportion due to mediation for the path: 'Perceived Consequences → Behaviour → Continued Adoption' was found to be negative. On the other hand, a strong mediation effect was found to be between perceived persuader legitimacy and continued adoption (80.4% of the total effect) as shown in Table IX 29.

Path	p value	c	c'	Proportion due to mediation
Perceived Persuader Legitimacy → Behaviour → Continued Adoption	<0.01	0.097	0.019	80.4%
Perceived Urgency → Behaviour → Continued Adoption	0.025	1.819	1.398	23.1%
Perceived Consequences → Behaviour → Continued Adoption	<0.01	-0.391	-1.196	205.9%

Table IX 29: Mediation Effects of Behaviour on Continued Adoption - Study I

In Study II, all the mediation effects were also found to be statistically significant ($p<0.05$). The proportion due to mediation for the path: 'Perceived Persuader Legitimacy → Behaviour → Continued Adoption' indicates that there is no direct relationship between perceived

persuader legitimacy and continued adoption (the continued adoption is totally explained by the variable behaviour). The relationship between behaviour and continued adoption is negative. The strongest mediation effect appears between perceived urgency and continued adoption (30% of the total effect) as shown in Table IX 30.

Path	p value	c	c'	Proportion due to mediation
Perceived persuader legitimacy → Behaviour → Continued adoption	<0.001	0.679	-0.103	115%
Perceived urgency → Behaviour → Continued adoption	<0.001	2.123	1.475	30%
Perceived consequences → Behaviour → Continued adoption	<0.001	1.295	1.078	16%

Table IX 30: Mediation Effects of Behaviour on Continued Adoption - Study II

In Study III, all the mediation effects are statistically significant ($p<0.05$). The proportion due to mediation for the path: 'Perceived Consequences → Behaviour → Continued Adoption' indicates that there is no direct relationship between perceived consequences and continued adoption (the continued adoption is totally explained by the variable behaviour). The actual relationship between behaviour and continued adoption is negative as shown in Table IX 31. Strong mediation effect appears for the other two paths, too (86% and 76% of the total effect). In consequence, the variable behaviour has a great influence on continued adoption.

Path	p value	c	c'	Proportion due to mediation
Perceived Persuader Legitimacy → Behaviour → Continued Adoption	0.003	0.131	0.019	86%
Perceived Urgency → Behaviour → Continued Adoption	0.002	0.301	-0.199	166%
Perceived Consequences → Behaviour → Continued Adoption	0.014	0.234	0.057	76%

Table IX 31: Mediation Effects of Behaviour on Continued Adoption - Study III

There are not many empirical studies whose findings can be easily compared and contrasted with the findings of this thesis. The author could not find any studies that investigate the relationship between perceived persuader legitimacy and continued adoption or how this relationship is mediated by behaviour. Similarly, there are not any studies that examine the impact of perceived urgency on the actualisation and continued adoption of pro-environmental behaviours. Urgency is often studied in the context of organisational change initiatives, but it is rarely investigated in the context of sustainability diffusion.

Although there are not any studies that specifically investigate the impact of perceived consequences on the continued adoption of pro-environmental behaviours, there are a few

studies that appear to examine the influence of behavioural variables which are somewhat relevant or can be related to the construct of 'perceived consequences'. For example, Liobikienė and Juknys (2016) investigated the influence of awareness of consequences and environmental risk perception on the adoption of pro-environmental behaviours. They used the value-belief-norm theory as a theoretical foundation. Surprisingly, their investigation concluded that the relationship between awareness of behavioural consequences and the update of pro-environmental behaviours was negative (B= −0.026; Beta= −0.043; Sig. 0.185). It appears that being aware of the consequences of one's actions does not necessarily lead to the actualisation of a behaviour that can eliminate or at least mitigate the risk of negative consequences. This finding is consistent with the findings of Study I, but it contradicts the findings of Study II and Study III. This could mean that the influence of 'perceived consequences' differs from one scenario to another, depending upon the situational variables of the environment in which the employees operate and also on employees' perception of the severity of consequences.

Another study by Bockarjova and Steg (2014) used the Protection Motivation Theory to examine the behavioural factors that influence the adoption of electric vehicles. They studied several variables one of which was; 'perceived severity of environmental risks'. They concluded that people were "more likely to adopt an electric vehicle when they perceived the negative consequences caused by conventional vehicles as more severe and when they expected electric vehicles to decrease these consequences" (Bockarjova and Steg, 2014, p. 276). This means that perceived consequences does have an impact on people's adoption decisions provided that they are made aware of; the consequences, their significance or severity and how the risk of these consequences can be mitigated or eliminated altogether.

Another construct that is, somewhat, related to perceived consequences is 'environmental concern'. Hsiao and Chen (2017) explored the role of environmental concern in the adoption of e-book subscription services. Their investigation concluded that environmental concern had a positive, indirect impact on the participants' behavioural intention to pay for e-book subscription services ($\beta = 0.084$, $t = 0.706$). The relationship between environmental concern and intention was found to be mediated by attitude ($\beta = 0.163$, $t = 2.831$).

9.2.21 Confirmation

This thesis conceptualised 'confirmation' as the 'lock-in' mechanisms which facilitate the institutionalisation of new practices, routines and behaviours. Wagner et al., (2011) stated that in the 'lock-in' process, organisations attempt to sustain an equilibrium and 'lock out' competing ideas. The state of locked-in can create either negative or positive situations. For

example, a locked-in state is necessary at the final stage of sustainability diffusion to ensure that sustainability practices become an everyday routine within an organisation. However, the organisation could be locked-in to a situation that is no longer favourable. It was hypothesised that confirmation is path-dependent on behaviour. In other words, confirmation cannot occur without the successful actualisation of the pro-environmental behaviour.

The nature of the structural relationship between behaviour and confirmation was examined using 3 different data sets and 2 structural models. In Study I (i.e. duplex printing), the SEM analysis of Model #2 revealed that the actualisation of duplex printing behaviour has a significant, positive impact on the confirmation (one unit increase in behaviour leads to 0.751 units increase in confirmation). Similarly, the results of SEM analysis of Model #3 suggest that the actualisation of duplex printing behaviour has a significant, positive impact on the confirmation (one unit increase in behaviour leads to 0.747 units increase in confirmation).

In Study II (i.e. sustainable computing), the SEM analysis of Model #2 revealed that the operationalisation of the sustainable computing behaviour has a significant, positive impact on the confirmation (one unit increase in behaviour leads to 0.978 units increase in confirmation). Similarly, the results of SEM analysis of Model #3 suggest that the actualisation of the sustainable computing behaviour has a significant, positive impact on the confirmation (one unit increase in behaviour leads to 0.975 units increase in confirmation).

The relationship between the two constructs was much more significant in scenario III. In Study III, the SEM analysis of Model #2 revealed that the actualisation of sustainability culture has a significant, positive impact on confirmation of that culture (one unit increase in behaviour leads to 1.069 units increase in confirmation). Similarly, the SEM of Model #3 revealed that the operationalisation of sustainability has a significant, positive impact on the confirmation of the sustainability culture in the organisation (one unit increase in behaviour leads to 1.071 units increase in confirmation).

The abovementioned results strongly support the notion that confirmation is path-dependent on behaviour. A pro-environmental behaviour cannot be confirmed or locked-in until the behaviour is successfully operationalised.

9.2.22 Innovative Behaviour

There are clear differences in the rate at which different people adopt new innovations; this is sometimes referred to as innovativeness (Reinhardt and Gurtner, 2015). It is related to human behaviour, decision-making and a whole host of other variables such as resources, organisational context and the characteristics of particular innovations. Rogers (2003)

developed a set of categories to help standardise and simplify future research. Rogers' categories included: innovators; early adopters; early majority; late majority; and laggards. This thesis argued that:

- H25a: employees' innovativeness is positively related to their attitudes towards the adoption of sustainability / new sustainability initiatives.
- H25b: employees' innovativeness is positively related to their behavioural intentions to adopt sustainability / new sustainability initiatives.
- H25c: employees' innovativeness is positively related to their willingness to decide in favour of the adoption of sustainability / new sustainability initiatives.
- H25d: employees' innovativeness is positively related to the actualisation of sustainability / new sustainability initiatives.
- H25e: employees' innovativeness is positively related to the diffusion rate of sustainability / new sustainability initiatives.

The above hypotheses were thoroughly tested using 3 different data sets (i.e. 3 scenarios). All of the hypotheses (H25a-H25e) were accepted in all 3 studies. In Study I, innovative behaviour was found to have a significant, positive impact on employees' attitudes (B= 0.176, p= 0.001), behavioural intention (B= 0.293, p= 0.001) and behaviour (B= 0.227, p= 0.001) as well as on the rate by which duplex printing is diffused in UK universities (B= 0.155, p= 0.010). The most significant relationship was between innovation behaviour and intention - one unit increase in the innovative behaviour determines a 0.293 increase in intention. The innovative behaviour also accounts for 4.9% of the variation in intention as seen in Table IX 32.

Relationship	Adjusted R square	B	p
Innovative Behaviour → Attitude	0.019	0.176	0.001
Innovative Behaviour → Intention	0.049	0.293	<0.001
Innovative Behaviour → Behaviour	0.029	0.227	<0.001
Innovative Behaviour → Diffusion Rate	0.011	0.155	0.010

Table IX 32: Innovative Behaviour as an Independent Variable - Study I

It was also found that innovative behaviour has a significant influence on the adoption (B=0.523, Exp(B)=1.688, p=0.005). The relationship is positive; subjects with high innovative behaviour levels have about 168% more chances to adopt duplex printing compared to the subjects with low innovative behaviour levels.

In scenario II (i.e. sustainable computing), innovative behaviour was again found to have a significant, positive impact on employees' attitudes (B= 0.375; p= <0.001), behavioural intention (B= 0.664; p= <0.001) and behaviour (B= 0.669; p= <0.001), as well as on the rate by which sustainable computing is diffused (B= 1.176; p= <0.001). The most significant

relationship was between innovation behaviour and the diffusion rate of sustainable computing - one unit increase in innovative behaviour determines a 1.176 increase in the rate by which sustainable computing is diffused as shown in Table IX 33. Furthermore, the innovative behaviour accounts for 40.4% of the variation in the diffusion rate.

Relationship	Adjusted R square	B	p
Innovative Behaviour → Attitude	0.146	0.375	<0.001
Innovative Behaviour → Intention	0.201	0.664	<0.001
Innovative Behaviour → Behaviour	0.192	0.669	<0.001
Innovative Behaviour → Diffusion Rate	0.404	1.176	<0.001

Table IX 33: Innovative Behaviour as an Independent Variable - Study II

The results also suggest that innovative behaviour has a significant influence on the adoption of sustainable computing (B=0.966, Exp(B)=2.627, p<0.001). The relationship is positive: subjects with high innovative behaviour levels have about 262% more chances to adopt the sustainable computing compared to the subjects with low innovative behaviour levels.

In scenario III (i.e. sustainability culture), innovative behaviour was found to have a significant, positive impact on employees' attitudes (B= 0.370; p= <0.001), behavioural intention (B= 0.398; p= <0.001) and behaviour (B= 0.508; p= <0.001), as well as on the rate by which sustainability is diffused (B= 1.124; p= <0.001). The most significant relationship was again between innovation behaviour and the diffusion rate of sustainability - one unit increase in innovative behaviour determines 1.124 units increase in the diffusion rate as shown in Table IX 34. Innovative behaviour accounts for 68% of the variation in the diffusion rate.

Relationship	Adjusted R square	B	p
Innovative Behaviour → Attitude	0.191	0.370	<0.001
Innovative Behaviour → Intention	0.178	0.398	<0.001
Innovative Behaviour → Behaviour	0.241	0.508	<0.001
Innovative Behaviour → Diffusion Rate	0.688	1.124	<0.001

Table IX 34: Innovative Behaviour as an Independent Variable - Study III

Moreover, the innovative behaviour also appears to have a significant influence on the adoption (B=1.919, Exp(B)=6.814, p<0.001). The relationship is positive and strong: employees with high innovative behaviour levels have about 681% (or 6.8 times) more chances to adopt sustainability compared to the subjects with low innovative behaviour levels.

From the abovementioned statistics, one can conclude that the importance of adopters' innovative behaviour as a diffusion facilitator increases as the innovation being diffused becomes more complicated. In other words, the impact of adopters' innovativeness on adoption decisions and on the rate of diffusion is at its highest when the innovation is perceived to be complex. Intuitively, the use of duplex printing is less complicated than the actualisation of

sustainable computing. Meanwhile, the diffusion of sustainability mindset in the workplace is much more complicated because it would require employees to embrace both, sustainable computing and duplex printing along with other pro-sustainability initiatives. Hence, innovative behaviour has the highest impact on the adoption and diffusion of sustainability culture in the workplace. The diffusion of sustainability requires employees to be very innovative and openheartedly embrace any pro-sustainability behaviour.

There are very few empirical studies that investigate the nature of the relationship between innovative behaviour on the one hand and attitude, intention, behaviour, adoption and diffusion rate on the other hand in the context of sustainability. The most relevant study that the author found in the academic literature was that of Chen (2014). Chen explored the impact of customer innovativeness on their behavioural intention to install solar power systems. Chen found that customers' innovativeness had a significant, positive impact on the participants' intention to install solar power systems ($\gamma 2=0.31$, t-value=5.68).

Another study by Far and Rezaei-Moghaddam (2017) explored the impact of innovativeness on agricultural consultants' behavioural intentions to adopt precision agriculture as a sustainable solution to the environmental problems caused by conventional agricultural systems. They incorporated the construct of innovativeness into the technology acceptance model and tried to validate the new model using a sample of 183 agricultural consultants. They concluded that individuals' innovativeness ($p < 0.01$, $\gamma = 0.23$) had a direct and significant influence on perceived usefulness of precision technologies as well as on adopters' attitudes ($p < 0.01$, $\gamma = 0.40$). They also found a positive relationship between innovativeness and behavioural intention.

9.3 Theoretical & Practical Contributions

This research's findings make numerous theoretical and practical contributions. Practically, two out of the three studies targeted the employees of UK universities. Therefore, the findings can be used by sustainability chairs, sustainability managers or environmental officers at higher education institutions to facilitate the creation of a workplace environment conducive to the diffusion of pro-sustainability initiatives. This research illuminates the variables that influence university employees' attitudes towards sustainability and the relationship between attitude and behavioural intention. The findings make it very clear that in order to speed up the rate of sustainability diffusion, sustainability managers must emphasise the relative advantage, compatibility, subjective norm and the urgency of the initiatives under implementation and de-emphasise complexities and the risks associated with their operationalisation.

Moreover, this research's findings should be of great value to environmental campaigners and sustainability communicators. This research evidently illustrated that the diffusion of pro-environmental initiatives begins with attitude. Campaigners and communicators need to realise that an employee's attitude towards the adoption of pro-sustainability initiative is influenced by four perceptual variables, namely: relative advantage; compatibility; communicability; and complexity. Therefore, campaigners and communicators ought to focus all their efforts on demonstrating the relative advantages and the compatibility of the initiative. The campaigners/communicators must also clear any misconceptions about the complexities and potential implications of adopting the initiative. Once that's been done, the next step is to create an atmosphere in which social pressure is directed in favour of adopting the initiative in question; and to foster an environment in which the potential adopters feel confident in their ability to operationalise it. Finally, the campaigners/communicators need to create a level of urgency that is sufficient enough to push the potential adopters to decide in favour of adoption.

It is important to note that the proposed sustainability diffusion model is context specific. Although it has the power to predict and to explain pro-sustainability behaviour in UK universities and service-based businesses, it may not be as reliable if applied under different contextual conditions (e.g. to explain sustainability adoption in supply chains).

Theoretically, the importance of this research does not stem from the mere identification of the determinants of sustainability diffusion, but rather from the multi-disciplinary analysis of the subject at hand which draws its arguments from both, the theoretical and empirical literature. It analyses the different forms of innovation and establishes a conceptual link between sustainability and organisational innovation. It also draws on the existing behavioural theories in the field of innovation diffusion to help understand the issues that are central to sustainability adoption. More importantly, it goes beyond the analysis of individuals' or organisations' motives for sustainability adoption towards an improved understanding of how workers' attitudes and perceptions of sustainability can influence the rate of its diffusion. Hence, the arguments made in this thesis complement and add value to, the sustainability implementation research by identifying the factors that have a significant impact on the collective adoption of sustainability. They also initiate a debate about the applicability of innovation diffusion theories and the theories of behavioural control to sustainability.

There have not been any attempts in the academic literature to apply Rogers' (1962) Diffusion of Innovations Theory to sustainability holistically, even though there are a few studies that use Rogers' innovation attributes to determine the predictors of pro-sustainability innovations' adoption. The establishment of a link between sustainability and organisational innovation

meant that Rogers' theory can be applied to sustainability to help understand and/or explain the factors that influence the diffusion and adoption pro-sustainability initiatives/behaviours. Besides, this study is one of very few studies, if not the only study, that argued in favour of incorporating Ajzen's (1991) theory of planned behaviour into Rogers' (1983) innovation-decision process model. The merger helped to eliminate, or at least mitigate, the theoretical weaknesses of both theories. Rogers' (1962) theory does not account for the person-specific variables, whereas Ajzen's (1991) theory focuses more on the individual and less on innovation itself. Hence, it seemed intuitive to merge the two theories in order to account for both the person-specific and innovation-specific variables.

Furthermore, this research could be the only empirical study that has investigated the factors that influence the rate by which pro-sustainability initiatives are diffused. The element of time is rarely considered in sustainability research. Also, there are very few empirical studies that investigate the nature of the relationship between innovative behaviour on the one hand and attitude, intention, behaviour, adoption and diffusion rate on the other hand in the context of sustainability. Besides, this research's findings are distinctively unique in the sense that there are not many studies, if any at all, that investigate the mediation effect of attitude on the relationship between knowledge, relative advantage, compatibility, risk, observability, communicability and trialability on the one hand and on intention on the other hand.

Another important theoretical contribution is the conceptualisation of sustainability as a workplace mindset. There are not any empirical studies in the sustainability literature that conceptualise sustainability as a workplace mindset. Often scholars study the adoption of pro-environmental behaviours or practices, but they rarely investigate the adoption of sustainability itself as an umbrella mindset/concept/philosophy/culture.

Despite its many theoretical and practical contributions, this research has some limitations. Firstly, there are many factors that influence people's attitudes and behavioural intentions, but this research only tested and validated a selected few. Therefore, there is a need to incorporate more variables into the proposed model to boost its predictive and explanatory powers. Secondly, attitude-based research is commonly criticised for the lack of accuracy and the weakness of the link between self-reported intentions and behaviour. Thirdly, two out of the three validation studies targeted the employees of UK universities which may raise some concerns about the diversity of the research sample and the generalisability of conclusions.

Despite the limitations, this research's findings contribute significantly to scholars' efforts to fill three important gaps in the sustainability literature. Firstly, the findings broadened the

current conceptualisation of sustainability. The research established and validated a conceptual link between sustainability and innovation. Conceptualising sustainability as an innovation enables scholars to tap into existing knowledge in the research field of innovation diffusion. It also encourages them to abandon the silo approach in studying sustainability diffusion and to move towards a more holistic understanding of sustainability implementation.

Secondly, this research put forth a sustainability diffusion theory in an attempt to fill a gap in a significantly underdeveloped area of research. Although the number of empirical studies investigating sustainability and the implications of its adoption has grown rapidly in recent years, the number of theoretically grounded sustainability implementation theories remains alarmingly insufficient. The lack of theories that conceptualise the diffusion process of pro-sustainability behaviours was the primary motive for undertaking this research. The author believed that organisations often know what they should adopt and which sustainability initiatives they should implement, but they do not necessarily know how to influence their employees' attitudes and behavioural intentions in favour of sustainability adoption. This research, therefore, developed a sustainability diffusion model which could be used to bridge the gap between knowing and doing at the organisational level and between attitude and actual behaviour at the individual level.

Thirdly, interdisciplinary research on the subject of sustainability adoption is lacking. This research is one of few studies that have embraced an interdisciplinary approach to studying the issues that are central to the adoption of pro-sustainability initiatives. Sustainability is a complex construct so it needs to be studied interdisciplinarily in order to facilitate broader conceptualisation of its principles, applications and implications. This research tapped into existing knowledge in three different research disciplines (i.e. sustainable management; innovation diffusion; and persuasive communications) in order to find an explanation and a solution to the problem of non-adoption.

9.4 Conclusions

This chapter discussed the findings of three empirical investigations in light of relevant academic literature. It highlighted how the different research hypotheses were tested and how the components of the proposed sustainability diffusion model have been validated. Surprisingly, several components of the proposed model turned out to be statistically insignificant or were rejected altogether. These were: knowledge, perceived self-interest, perceived persuader legitimacy, perceived consequences, perceived argument quality, trialability and perceived source credibility. Once these constructs have been removed and the

model have been restructured in accordance with the results of SEM analysis, an entirely new version of the proposed 'sustainability diffusion model' emerged (*See* Figure IX-2).

Unexpectedly, the new version of the proposed model uses Ajzen's (1991) Theory of Planned Behaviour as a foundation instead of Rogers' (1983) innovation-decision process model. In other words, the new model maintained almost all the features of the theory of planned behaviour and only absorbed some, but not all, of the components of Rogers' innovation-decision process model. Nevertheless, the new model maintained its holistic nature. It still takes into account, both, the person-specific and innovation-specific factors that influence the diffusion, adoption and actualisation of pro-sustainability behaviours/initiatives.

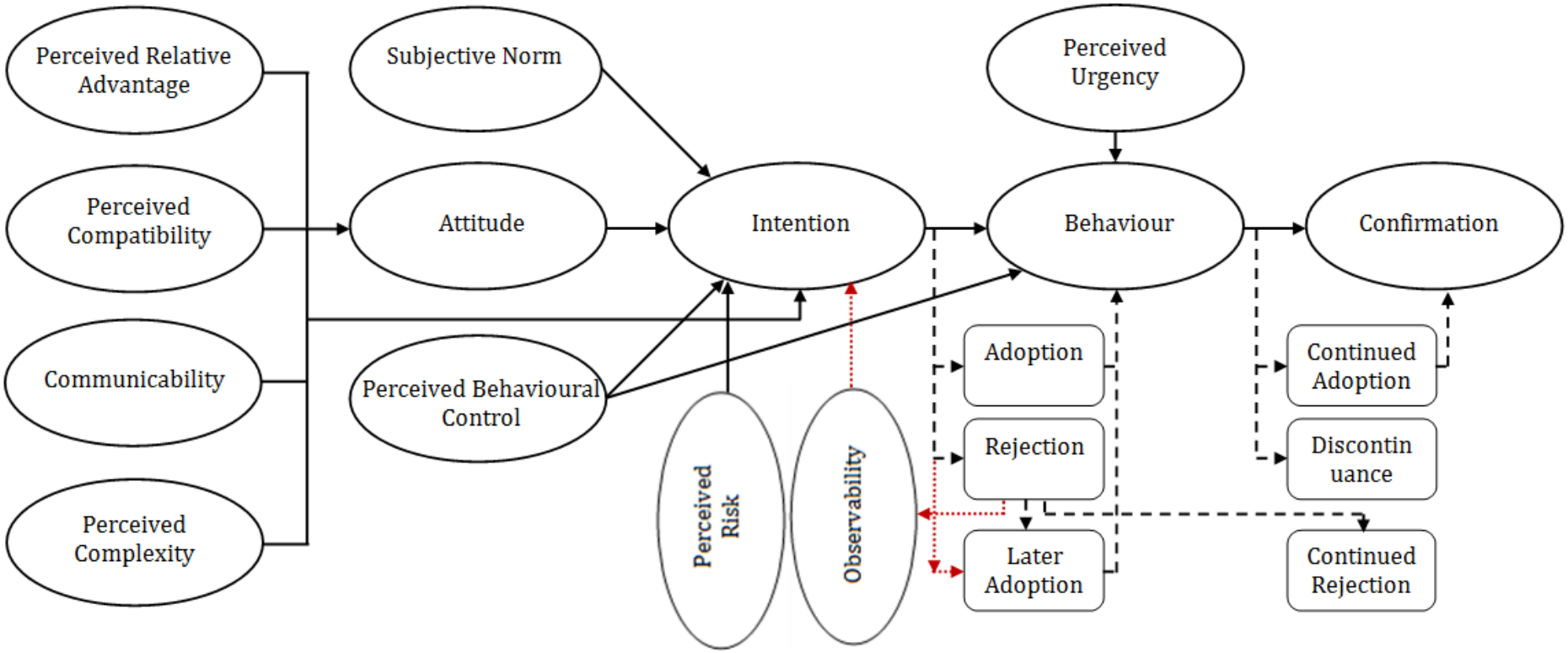


Figure IX - 1: The Post-Validation Version of the Proposed Sustainability Diffusion Mode

Chapter X

Conclusion

10.1 Introduction

This chapter summarises the conclusions of the four empirical investigations, namely: the Delphi study; diffusion of duplex printing; diffusion of sustainable computing; and diffusion of sustainability culture. It is structured by objectives to clearly demonstrate how the research's aim was successfully achieved. This research aimed to develop, verify and validate a Sustainability Diffusion Model (SDM). To achieve this aim, the author had to accomplish seven research objectives, namely: (1) to conduct an in-depth review of all the relevant areas of research and develop a robust theoretical foundation for the SDM; (2) to establish the conceptual link(s) between sustainability and innovation; (3) to evaluate the feasibility and theoretical viability of incorporating Ajzen's (1991) theory of planned behaviour into Rogers' (1962) innovation-decision process model; (4) to identify additional behavioural factors which support or hinder the diffusion of pro-sustainability behaviours; (5) to develop a conceptual sustainability diffusion model; (6) to verify the conceptual SDM using the Delphi method; and (7) to validate the proposed SDM using the scenarios of three pro-sustainability behaviours.

10.2 The Research Gap

The research began with an in-depth review of sustainability implementation literature; innovation diffusion literature; and persuasive communication literature. It was concluded from the review that although sustainability research has become increasingly prominent in recent years, there remains a wide gap between what is known and what is put into practice. While the literature on sustainability implementation continues to grow, the knowledge on how to increase the rate of diffusion and the speed of adoption among employees does not. Sustainability scholars have not yet sufficiently addressed this issue. In fact, the number of theoretically-grounded sustainability implementation models, theories and frameworks is alarmingly insufficient despite the rapid growth in the number of empirical studies that investigate sustainability and the implications of its implementation.

10.3 Sustainability and Innovation - The Conceptual Link

In order to justify the use of Rogers' (1962) diffusion of innovations theory as a theoretical foundation for this research study, the conceptual link(s) between sustainability and innovation had to be established prior to the commencement of the empirical investigations. It was difficult to link the two constructs on the basis of their definitions alone. The definitions of

innovation tend to focus on the characteristics of the construct, while those of sustainability focus primarily on its dimensions. Therefore, a conceptual discussion was necessary to illustrate the conceptual synergies that exist between sustainability and innovation. The discussion covered six defining characteristics of innovation, namely: newness; significance of improvement; magnitude of change; usefulness; commercial value; and success.

The conceptual link between sustainability and innovation was empirically verified using a Delphi study. The experts were asked whether they thought sustainability was an innovation, a driver of innovations, both; an innovation and driver of innovations or it has nothing to do with innovation. Over 61% of the panellists indicated that they were convinced sustainability is both an innovation and a driver of innovations.

10.4 Incorporation of Ajzen's (1991) Theory into Rogers' (1962) Model

Once the conceptual link between sustainability and innovation had been established, the author was able to, justifiably, borrow theories and concepts from the innovation diffusion literature and behaviour management literature and apply them to sustainability in order to develop an integrated and multi-disciplinary diffusion model. Ajzen's (1991) theory of planned behaviour and Rogers' (1962) innovation-decision process model were both used as a theoretical foundation for the proposed model. Using both theories, this study identified several factors which were believed to have a significant impact on the rate of sustainability diffusion, some of which had been either neglected by other researchers. These factors were then incorporated into a single structure to produce a "sustainability diffusion model".

To ensure that the hypotheses which underlie the structural architecture of the proposed model are conceptually and theoretical robust, the Delphi panellists were asked whether they thought it was justifiable to use Rogers' (1983) innovation-decision process model to help understand the factors that influence the rate of sustainability diffusion. The use of the model received an overwhelming support from the majority of the experts. It is considered the right step forward towards a better understanding of the factors that affect, positively or negatively, the adoption and implementation of pro-sustainability initiatives.

The experts were also asked whether they considered the merger between Rogers' (1962) model and Ajzen's (1991) theory to be valid from a conceptual point of view. Initially, the results were inconclusive. Although there was not a consensus in the 1st round in relation to the use of Rogers' (1962) model and Ajzen's (1991) theory independently and in isolation, there was an agreement among the participants that the merger between the two theories to study the

diffusion of sustainability is conceptually valid. The use of both; Rogers' (1962) model and Ajzen's (1991) theory was decisively supported in the 2nd round though (*See* Chapter VII).

10.5 Identification of Additional Variables

In addition to merging Ajzen's (1991) theory with Rogers' (1962) innovation-decision process model, the authors incorporated 8 new variables into the new model, namely: perceived source credibility; perceived argument quality; perceived self-interest; perceived consequences; urgency of change; perceived persuader legitimacy; perceived risk; and communicability.

The Delphi study sought the participants' opinions in relation to the inclusion of the 8 new variables in the final, combined model. All the new constructs received an overwhelming support from the majority of the participants. The consensus was achieved in the 1st round. However, although the majority of the experts supported the incorporation of the new factors, several concerns were raised and recommendations provided, by some of the experts. Most of the concerns were related to the complexity and architecture of the model. For example;

> "There's nothing included that I disagree with, but part of me thinks that some of the strength of a model is that is acts to simplify a complex process into something more manageable - and there's a lot going on in this model!"

10.6 Development of a Conceptual SDM

Incorporating Ajzen's TPB into Rogers' IDPM helped to create a holistic sustainability diffusion model that takes into consideration many of the behavioural factors that influence individuals' attitudes towards the adoption and implementation of pro-sustainability initiatives/behaviours. Besides, the 8 additional variables helped to boost the model's predictive power and strengthened its theoretical foundation. Figure X-1 shows the initial draft of the proposed sustainability diffusion model before it was modified in accordance with feedback/comments received from the experts who took part in the Delphi study.

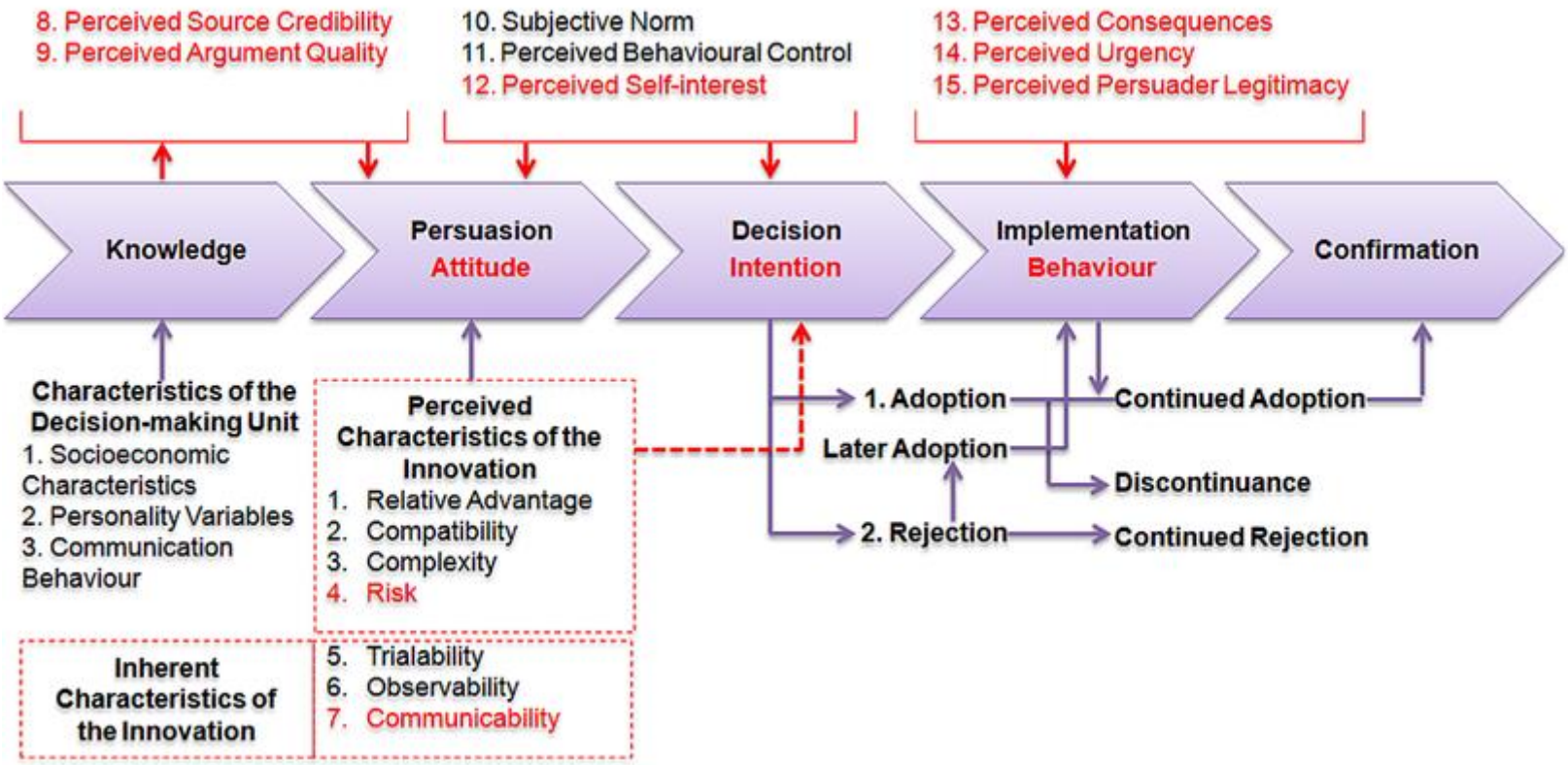


Figure X- 1: The Initial Sustainability Diffusion Model (Before Verification)

10.7 Verification of the Proposed SDM

Although the initial version of the proposed sustainability diffusion model was underlined by strong theoretical and conceptual assumptions, its underlying propositions needed to be put under the scrutiny of sustainability scholars and practitioners. The model was successfully verified using the Delphi technique. It received huge support from the majority of the participants. However, although it was considered to be the right step forward towards better understanding of the factors that affect the diffusion pro-sustainability initiatives/behaviours, several concerns were raised particularly about the linearity of the model. Some experts also recommended expanding the model further to include emotional factors and other variables that may be beyond the control of the unit(s) of adoption. For example;

> "To my opinion within "Attitude" and "Intention" there is not only "Self interest" that matters, but also concern about third parties, (altruism) especially when it comes to sustainability"

The additional factors/variables which were recommended by the Delphi participants could not be incorporated into our model for two main reasons. First, the model was already too complex; therefore, incorporating more variables would make it far more complicated and very difficult to test and validate empirically. Secondly, some of the recommended variables were incompatible with Rogers' model and Ajzen's theory. They did not fit anywhere on the structural architecture of the proposed model. This is not to say that the recommended variables do not have any impact on people's behavioural intentions or adoption decisions. They just were not compatible with the proposed model.

Figure X-2 shows an improved version of the proposed SDM after it was modified in accordance with feedback received from the experts who took part in the Delphi study.

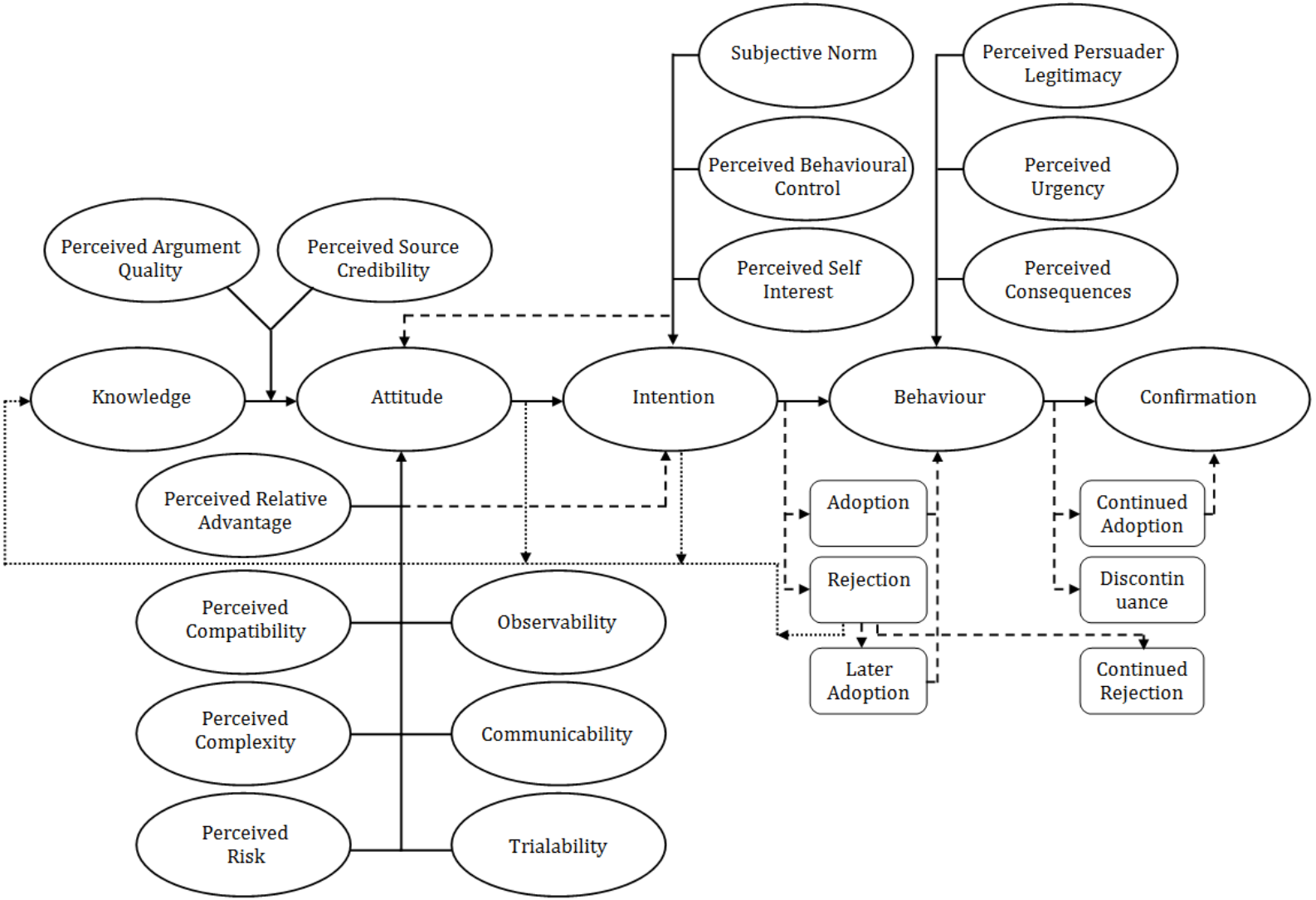


Figure X- 2: An Improved Version of the Proposed Sustainability Diffusion Model (After Verification)

10.8 Validation of the Proposed SDM

The verified model underwent very a thorough validation process. The hypotheses which underlie the model were empirically tested in three different scenarios; namely, the diffusion of duplex printing; the diffusion of sustainable computing; and the diffusion of sustainability culture. In each scenario, structural equation modelling (SEM) was performed 3 times; (1) the theory of planned behaviour; (2) the innovation-decision process model; and (3) the sustainability diffusion model. The three investigations targeted individuals who work in an office environment because they are more likely to use printers and computers for their work. However, two of the studies (i.e. duplex printing and sustainability culture) specifically targeted individuals who work for UK universities. The 'diffusion of sustainability computing' study, on the other hand, targeted any person who uses a computer at work.

Surprisingly, several components of the "verified" model turned out to be statistically insignificant or were rejected altogether. These were: knowledge, perceived self-interest, perceived persuader legitimacy, perceived consequences, perceived argument quality, trialability and perceived source credibility. Accordingly, once these constructs have been removed and the model has been restructured in accordance with the results of SEM analysis, an entirely new version of the 'sustainability diffusion model' emerged (*See* Figure X-3). Unexpectedly, the new version of the proposed model relies more on Ajzen's (1991) Theory of Planned Behaviour as a theoretical foundation than on Rogers' (1962) innovation-decision process model. In other words, the new model maintained almost all the features of the theory of planned behaviour and only absorbed some, but not all, of the components of Rogers' innovation-decision process model. Nevertheless, the new model maintained its holistic nature. It still takes into account, both, the person-specific and innovation-specific factors that influence the diffusion, adoption and actualisation of pro-sustainability behaviours/initiatives.

10.9 The Final, Validated Version of the SDM

The final version of the sustainability diffusion model postulates that the adoption process of pro-sustainability behaviours comprises of four sequential, path-dependent phases, namely: attitude (persuasion); behavioural intention (pre-decision); adoption/rejection (decision); behaviour (implementation); and confirmation (routinisation). Each phase is influenced by a number of innovation-specific and/or person-specific variables. These variables are perceived relative advantage; perceived compatibility; communicability; perceived risk; subjective norm; perceived behavioural control; perceived risk; observability; and perceived urgency.

This research found that perceived relative advantage has a significant, positive impact on employees' behavioural intention to adopt and/or embrace duplex printing (B= 0.250), sustainable computing (B= 1.667) and sustainability mindset (B= 1.388). Generally, the findings from the three separate investigations strongly support the assumptions that perceived relative advantage has a significant, positive impact on employees' attitudes towards pro-sustainability behaviours and on their behavioural intentions to adopt and/or embrace pro-sustainability innovations. The relationship between the two constructs was strongest in 'Structural Model #3' in all scenarios, namely: duplex printing (B= 1.301), sustainable computing (B= 2.034) and sustainability culture (B= 0.927).

Similarly, perceived compatibility was found to be positively related to employees' attitudes towards the adoption of duplex printing (B=0.471, t=5.458, p<0.01), sustainable computing (B=0.274, t=3.993, p<0.01) and a sustainability mindset (B=0.373, t=5.068, p<0.001). The relationship between the two constructs was strongest in the duplex scenario whereby one unit increase in perceived compatibility is found to lead to 0.471 units increase in employees' favourable attitude towards the adoption of duplex printing.

Moreover, perceived compatibility was also found to be positively related to employees' behavioural intention to embrace duplex printing (B=0.650, t=8.317, p<0.01), sustainable computing (B=0.294, t=2.706, p<0.007) and sustainability (B=0.298, t=3.559, p<0.001). Again, the relationship between the two constructs was strongest in the duplex printing scenario whereby one unit increase in perceived compatibility is found to lead to 0.650 units increase in an employee's willingness to use duplex instead of single-sided printing.

The construct of perceived complexity was not discarded from the final model even though it was only supported in scenario II (i.e. sustainable computing: B=-0.109, t=-2.154, p=0.032) and was completely rejected in scenario I (i.e. duplex printing: B=0.156, t=2.230, p=0.026). The relationship between perceived complexity and employees' attitudes was statistically insignificant in scenario III (i.e. sustainability mindset). It appears that complexity has not been an issue for most of the participants. This is understandable considering that the use of duplex printing instead of single-sided printing as well as the sustainable use of personal computers is relatively easy. In other words, the three pro-sustainability behaviours investigated in this research were rather easy to adopt; hence, complexity was not perceived as a hindrance.

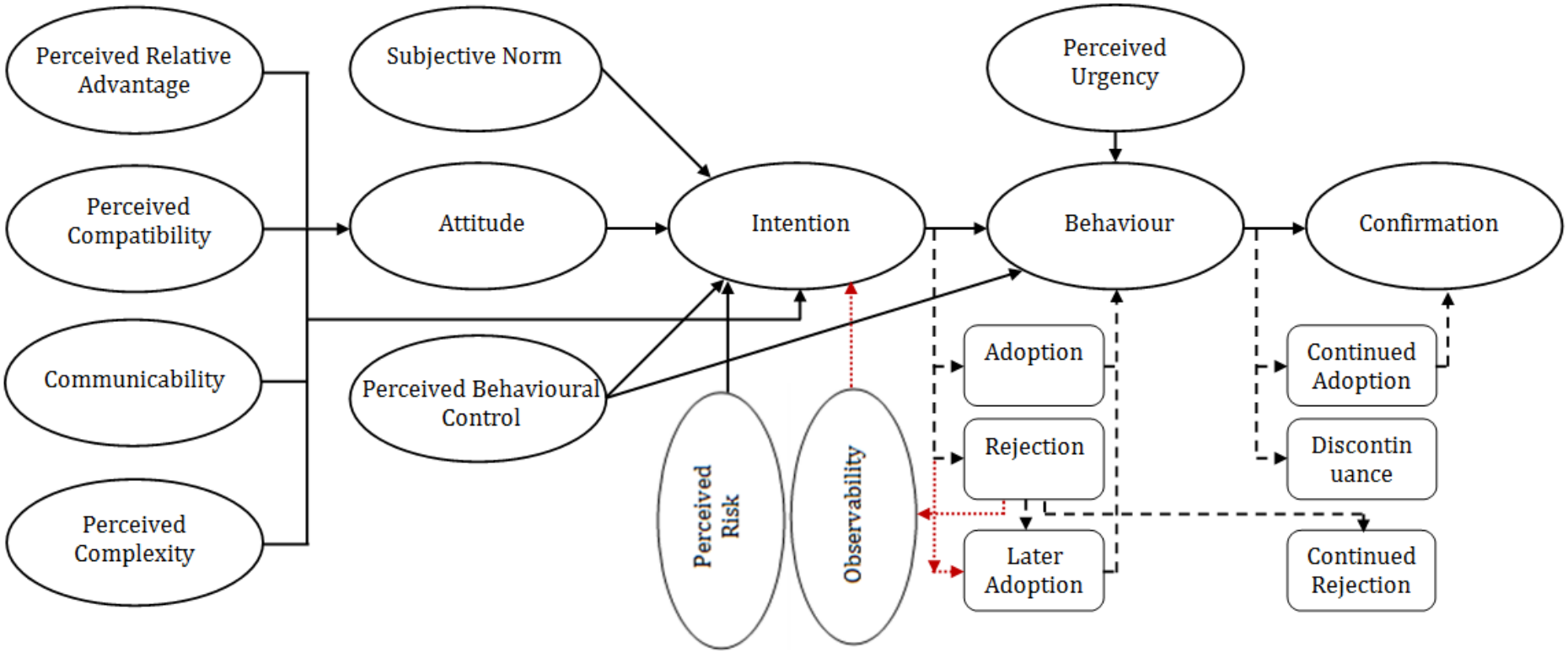


Figure X- 3: The Final, Post-Validation Version of the Sustainability Diffusion Model

The findings of this study and the findings of other scholars lead us to believe that the extent to which 'perceived complexity' influences people's attitudes, behavioural intentions and adoption decisions is determined by whether the innovation is inherently easy or inherently complex. Perceived complexity has an insignificant and a negligible impact on the diffusion of easy-to-implement and easy-to-use innovations. Its impact is most significant when the innovation is characterised as complex, difficult-to-implement and hard-to-use.

Perceived risk was found to have a negative impact on employees' behavioural intention to adopt duplex printing (B=-0.156, t=-2.837, p=0.005); sustainable computing (B=-0.165, t=-2.042, p=0.042); and a sustainability mindset (B=-0.154, t=-2.624, p=0.009). The negative relationship between the two constructs was strongest in the sustainable computing scenario whereby one unit increase in perceived risk is found to lead to 0.165 units decrease in an employee's willingness to adopt sustainable computing.

Observability and communicability were also found to have a positive impact on the rate of sustainability diffusion. Observability, in particular, appears to initiate a domino effect which facilitates the diffusion of the innovation to the 'early majority' of adopters. It also has a huge impact on the attitudes of 'late adopters' who tend to take much longer time observing a particular innovation before making a decision on whether to adopt it or reject it. The communicability of an innovation also facilitates for mass-adoption as information about the characteristics of the innovation (i.e. compatibility and relative advantage) is easily communicated, shared and transferred amongst potential adopters. In the 1st scenario, it was found that communicability is positively related to employees' attitudes towards the adoption of duplex printing (B=0.158, t=2.111, p=0.035); to employees' behavioural intention to adopt and actualise duplex printing (B=0.194, t=2.867, p=0.004); and to the rate by which duplex printing is diffused in the participants' organisations (B=0.256, t=2.663, p=0.008). The most significant relationship was between communicability and the rate of diffusion. A one unit increase in communicability was found to result in 0.256 units increase in diffusion rate of duplex printing.

This research also found that people's behavioural intentions to embrace pro-sustainability behaviours is influenced by their perceptions of social pressure, be it in favour or against those behaviours. In scenario I, subjective norm was found to relate positively to employees behavioural intention to adopt duplex printing (B=0.106, t=3.092, p=0.002). Similarly, the relationship between the two constructs was significantly positive in the 2nd scenario (B=0.339, t=5.794, p<0.001) - one unit increase in the subjective norm leads to 0.339 units increase in employees' behavioural intention to embrace sustainable computing.

The relationship between perceived behavioural control and employees' behavioural intention to adopt duplex printing also correlated positively in Study I (B=0.121, t=3.026, p=0.003) - one unit increase in the perceived behavioural control leads to 0.121 units increase in behavioural intention to adopt duplex printing. Similarly, in scenario II, it was found that one unit increase in the perceived behavioural control leads to 0.153 units increase in employees' intention to adopt sustainable computing (B=0.153, t=2.138, p=0.033). More importantly, perceived behavioural control also appeared to have a significant influence on the actualisation of pro-sustainability behaviours. In scenario I, a one unit increase in the perceived behavioural control was found to lead to 0.384 units increase in the actualisation of the duplex printing behaviour (B=0.384, t=9.886, p<0.01). In scenario II, a one unit increase in the perceived behavioural control appeared to result in 0.477 units increase in the actualisation of the sustainable computing behaviour (B=0.477, t=4.006, p<0.01). In scenario III, a one unit increase in perceived behavioural control was found to lead to 0.418 units increase in the actualisation of sustainability in the workplace (B=0.418, t=7.562, p<0.001). The relationship between the two constructs was most significant in the sustainable computing scenario which indicates that employees' perceptions of their ability to operationalise the sustainable computing habits, behaviours or practices have a significant influence not only on their willingness to engage in the diffusion of these behaviours or practices but also on their commitment to the actualisation of these behaviours.

This thesis also discovered that perceived urgency of change helps to generate social pressure within an organisation, which in turn increases an employee's willingness to engage in a particular pro-sustainability behaviour. Many change initiatives fail due to the fact that employees do not really recognise the need for, or urgency of change. Thus, without a sufficient level of dissatisfaction with the status quo, the diffusion efforts of sustainability will be destined to failure. The relationship between perceived urgency and the actualisation of pro-sustainability behaviours was positive in all 3 scenarios. In Study I, it was found that one unit increase in perceived urgency leads to 0.318 units increase in the actualisation of duplex printing in the workplace (B=0.318, t=5.752, p<0.01). The relationship was much stronger in Study II -one unit increase in the perceived urgency appeared to lead to 0.481 units increase in the actualisation of sustainable computing (B=0.481, t=4.226, p<0.01). This could mean that the participants perceive 'sustainable computing' to be a much more urgent behaviour than duplex printing. The diffusion of sustainability mindset was also perceived to be less urgent than the diffusion of sustainable computing. The results of Study III indicate that one unit increase in perceived urgency leads to 0.229 units increase in the actualisation of sustainability in the workplace (B=0.229, t=3.255, p=0.001).

10.9.1 Phase I: Attitude (Persuasion)

Persuading employees to change their attitude towards pro-environmental behaviours is the first step in the sustainability diffusion process. In academic research, attitude is considered a "fundamental concept to both social and behavioural sciences" (Ajzen, 2001). Hence, this thesis argued that unless employees have a positive attitude towards pro-sustainability behaviours, their diffusion is unlikely to succeed. The direct relationship between attitude and employees' behavioural intention to adopt pro-sustainability behaviours was confirmed in all 3 scenarios. The mediation effects of attitude between perceived relative advantage; perceived compatibility, perceived complexity; perceived risk; and communicability on the one hand and intention on the other hand were all found to be statistically significant ($p<0.05$). Two relationships appeared to be negative, namely: perceived complexity – intention; and perceived risk – intention. The other relationships were all found to be positive. The strongest mediation effect appeared between perceived complexity and intention (75% of the total effect).

10.9.2 Phase II: Behavioural Intention (Pre-Decision)

According to Ajzen (1991), the "antecedent of any behaviour is the intention to perform the behaviour". People are expected to do what they intend to do and to behave in accordance with their intentions. Intentions capture the motivational forces that influence behaviour; the stronger the intention, the more likely the performance of the behaviour.

In Study I (i.e. duplex printing), the SEM of Model #1 showed that the relationship between employees' intention to adopt duplex printing and the actualisation of the behaviour is statistically significant ($B= 0.750$, $Beta= 0.749$, $p<0.01$). The relationship was much more significant in Model #2 ($B= 7.609$, $Beta= 0.994$, $p<0.01$). The SEM of Model #2 revealed that intention has a significant, positive impact on the behaviour (one unit increase in intention leads to 7.609 units increase in behaviour). The relationship was again significant in Model #3 ($B= 1.023$, $Beta= 0.933$, $p<0.01$), but it was not as significant as in Model #2.

Moreover, the mediation effects of intention between subjective norm and perceived behavioural control on the one hand and the behaviour on the other hand. Very strong mediation effects appeared between subjective norm and behaviour (75% of the total effect). Intention was also found to mediate the relationship between subjective norm and perceived behavioural control on the one hand and adoption on the other hand. The strongest mediation effect appeared between subjective norm and adoption (45.9% of the total effect). The results also showed that intention had a very strong mediation effect between observability and later adoption (45.3% of the total effect).

In Study II (i.e. sustainable computing), the SEM of Model #1 showed that the relationship between employees' intention to adopt sustainable computing and the actualisation of the behaviour is statistically significant (B= 0.781, Beta= 0.739, $p<0.01$). The regression coefficients suggest that a one unit increase in employees' behavioural intention leads to 0.781 units increase in the use of sustainable computing. The relationship between the two constructs was slightly more significant in Model #2 (B= 0.947, Beta= 0.889, $p<0.01$). The SEM of Model #3 produced, somewhat, similar results (B= 0.966, Beta= 0.906, $p<0.01$). Moreover, the mediation effects of intention between subjective norm and perceived behavioural control on the one hand and the behaviour on the other hand were again found to be positive and statistically significant ($p<0.01$). Very strong mediation effects appeared subjective norm and behaviour (96% of the total effect). Furthermore, the mediation effects of intention between subjective norm and perceived behavioural control on the one hand and adoption on the other hand were also found to be positive and statistically significant ($p<0.01$). The strongest mediation effect appeared between subjective norm and adoption (48% of the total effect). Expectedly, intention was also found to strongly mediate the relationship between observability and the later adoption of sustainable computing (73% of the total effect).

Similar results were observed in Study III (i.e. sustainability mindset). The SEM of Model #1 showed that the relationship between employees' intention to adopt sustainable computing and the actualisation of the behaviour is statistically significant (B= 0.784, Beta= 0.652, $p<0.001$). The relationship was much more significant in Model #2 (B= 1.071, Beta= 0.878, $p<0.01$) - one unit increase in intention leads to 1.071 units increase in the actualisation of sustainability. The relationship was slightly less significant in Model #3 (B= 1.003, Beta= 0.829, $p<0.001$).

Moreover, the mediation effects of intention between subjective norm and perceived behavioural control were again found to be positive and statistically significant ($p<0.01$). A very strong mediation effect appeared between subjective norm and behaviour (58% of the total effect). Intention was also found to mediate the relationship between subjective norm and perceived behavioural control on the one hand and adoption on the other hand as well as between observability and later adoption (45% of the total effect). However, the mediation effects were not as significant as in Study I and Study II.

10.9.3 Phase III: Adoption/Rejection (Decision)

It is at this stage that the decision-making unit, be it a manager or an employee, decides on whether to adopt or reject a particular pro-sustainability behaviour. The adoption decision occurs silently and invisibly and it is very difficult to capture the exact moment of the decision. This research was not interested in the timing of a decision but was rather interested

in the factors that push the individual to decide in favour or against the adoption of pro-sustainability behaviours. In all 3 studies, perceived behavioural control was found to have a significant, positive impact on an employee's willingness to decide in favour of the adoption of pro-sustainability behaviours. In the 1st scenario, it was found that employees with high perceived behavioural control have 192% more chances to adopt duplex printing compared to the subjects with low perceived behavioural control (B=0.654, Exp(B)=1.924, p<0.01). The relationship was much more significant in the 2nd scenario. The analysis revealed that employees with high perceived behavioural control have 325% more chances to adopt the sustainable computing compared to the subjects with low perceived behavioural control (B=1.180, Exp(B)=3.256, p<0.01). In the 3rd scenario, the relationship was even more significant. It was found that employees with high perceived behavioural control have 352% more chances to adopt sustainability compared to the subjects with low perceived behavioural control (B=1.181, Exp(B)=3.526, p<0.001).

Moreover, subjective norm was also found to influence adoption/rejection decisions. The analysis revealed that employees with high levels of subjective norm have 146% more chances to adopt duplex printing compared to the subjects with low levels of subjective norm (B=0.378, Exp(B)=1.460, p=0.055). In Study II, the results showed that employees with high subjective norm have 206% more chances to adopt the sustainable computing compared to the subjects with low subjective norm (B=0.727, Exp(B)=2.069, p<0.01). In the 3rd scenario, it was found that employees working in an environment with high levels of pro-sustainability subjective norm have 172% more chances (on average) to adopt sustainability compared to employees who work in an environment with low levels of pro-sustainability subjective norm (B=0.546, Exp(B)=1.726, p=0.029).

10.9.4 Phase IV: Behaviour (Actualisation)

The actualisation of pro-sustainability behaviours often involves the modification, elimination or replacement of old routines, be it behavioural, organisational or operational, with new, higher order routines. The existence of higher order routines in a firm's initial conditions increases its capacity to diffuse new innovations. In other words, organisations that already have higher order routines or a culture that promotes innovative behaviours and continuous search for excellence prior to the implementation of sustainability are more likely to avoid some of the organisational implications of sustainability diffusion (e.g. resistance to change) than their counterparts with a culture that promotes standardisation and institutionalisation of routines. Besides, in order for an employee to fully embrace or actualise a pro-sustainability behaviour, they need to be convinced that: (1) the person who encourages them to embrace the

behaviour has a legitimate right to do so; (2) the behaviour is urgent and is significantly important; (3) and that there could be serious consequences if the behaviour is not actualised.

10.9.5 Phase V: Confirmation

This thesis conceptualised 'confirmation' as the 'lock-in' mechanisms which facilitate the institutionalisation of new practices, routines and behaviours. However, the term 'lock-in' does not necessarily mean total absence of change. The state of locked-in can create either negative or positive situations. For example, a locked-in state is necessary at the final stage of sustainability diffusion to ensure that sustainability practices become an everyday routine within the organisation. On the other hand, an organisation can become locked-in to a situation that is no longer favourable. Sustainability is dynamic in nature and requires lock-in mechanisms that ensure continuity of innovations. It was found that confirmation is path-dependent on behaviour. In other words, confirmation cannot occur without the successful actualisation of the pro-environmental behaviour. The relationship between the two constructs was most significant in scenario III in which the actualisation of sustainability culture appeared to have a significant, positive impact on confirmation of that culture (one unit increase in behaviour leads to 1.069 units increase in confirmation). This means that pro-sustainability behaviours cannot be locked-in until they are successfully operationalised.

10.10 Contribution to Knowledge

This thesis makes numerous academic contributions to the research fields of innovation diffusion; workplace psychology; behavioural management; change management and persuasion. These contributions include, but not limited to:

- ❖ Filling a Gap in the Sustainability Implementation Literature

Unfortunately, the existing theories have little to offer on how employees' perceptions and attitudes towards sustainability can be better managed to increase the rate of its diffusion and enhance the success probability of its adoption and implementation. One of the least understood areas of sustainability implementation is non-adoption. Sustainability, like many other innovations, requires a significant change in individuals' attitudes and behaviours. The extent to which an organisation is able to create a favourable attitude towards pro-sustainability behaviours/initiatives determines the success or failure of their implementation efforts. Unfortunately, the question of how organisations can favourably influence the attitudes of their workers towards sustainability remains unanswered. This research attempted to fill this gap by identifying some of the factors that influence employees' perceptions, attitudes and their willingness to embrace and actualise pro-sustainability behaviours in the workplace.

❖ Establishing a Conceptual Link between Sustainability and Organisational Innovation

This study is one of very few studies, if not the only study, that conceptualise sustainability as an organisational innovation. The sustainability literature often discusses sustainability as a driver of innovation (e.g. Ceschin and Gaziulusoy, 2016; Sarkar S. and Pansera, 2017) or as an outcome of an innovation process (i.e. eco products and services; and sustainable business models) (Horng et al., 2017; Friedman, 2011), but there have not been any attempts to link the two concepts as theoretical constructs. More importantly, the conceptual link between sustainability and organisational innovation was validated empirically using a Delphi study. The majority of experts who participated in the Delphi study consider sustainability to be an organisational innovation (53.57%). This was followed by management innovation (50%). However, no consensus was achieved in the 1st round as the consensus criterion was set to 70%. The experts' perceptions changed noticeably in the 2nd round. A decisive majority (79.17%) indicated that sustainability is primarily an organisational innovation, but it can also be seen as a process innovation, a management innovation, a product innovation, etc, depending upon the context in which it is studied.

❖ Using Rogers' (1962) Diffusion of Innovations Theory as a Theoretical Foundation

There have not been any attempts in the academic literature to apply Rogers' (1962) Diffusion of Innovations Theory to sustainability holistically, even though there are a few studies that use Rogers' innovation attributes to determine the predictors of pro-sustainability innovations' adoption. The establishment of a link between sustainability and organisational innovation meant that Rogers' theory can be, justifiably, applied to sustainability to help understand and/or explain the factors that influence the diffusion, adoption and implementation processes of pro-sustainability practices/behaviours. Hence, the Delphi panellists were asked whether they thought it was justifiable to use Rogers' (1983) innovation-decision process model to study the variables that affect the rate by which new sustainability practices/behaviours are diffused. The use of the model received an overwhelming support from the majority of the panellists. It is seen as the right step forward towards a better understanding of the factors that affect, positively or negatively, the adoption and implementation of pro-sustainability initiatives/behaviours.

❖ Incorporating Ajzen's (1991) Theory of Planned Behaviour into Rogers (1983) Model

This study is one of very few studies, if not the only study, that argue in favour of incorporating Ajzen's (1991) theory of planned behaviour (TPB) into Rogers' (1983) innovation-decision process model. The arguments put forth in this thesis are both conceptual

and empirical. Conceptually, the TPB is believed to be very compatible with the scope and conceptual arguments of Rogers' (1962) theory. In fact, the TPB fits very well into persuasion and decision stages of Rogers' innovation-decision process model. For example, the "persuasion stage" in Rogers' model conceptualises the factors that influence individuals' intentions to decide in favour or against a particular behaviour or a specific course of action which is the essence of the TPB. The TPB explains how individuals' behavioural intentions are affected by: their attitude towards the behaviour; the subjective norm; and their perceived behavioural control. The three variables combined shape individuals' intentions to adopt a particular behaviour (e.g. embrace sustainability). Accordingly, behaviours that are perceived favourably by the unit of adoption; that are viewed positively by society; and that are seen as easy to perform are likely to diffuse much faster than others.

More importantly, it was the author's strong convictions that a merger would help eliminate, or at least mitigate, the theoretical weaknesses of both theories. For example, although Rogers' (1962) theory helps us understand some of the innovation-specific variables that either accelerate or impede the rate of innovations diffusion, it does not account for the person-specific variables. In contrast, Ajzen's (1991) theory focuses more on the individual-specific variables and less on behaviour/innovation-specific factors. Hence, it seemed intuitive to incorporate Ajzen's theory into Rogers' innovation-decision process model to create a holistic sustainability diffusion model that takes into account a sufficient number of behavioural factors that influence individuals' attitudes and perceptions towards the adoption and implementation of pro-sustainability initiatives/behaviours.

Empirically, the sustainability experts who participated in the Delphi study were asked whether they considered the merger between Rogers' (1983) model and Ajzen's (1991) theory of planned behaviour to be valid from a theoretical and a conceptual point of view. Initially, the results were inconclusive. Although there was not a consensus in the 1st round in relation to the use of Rogers' (1983) model and Ajzen's (1991) theory independently and in isolation, there was an agreement among the participants that the merger between the two theories to study the diffusion of sustainability is conceptually valid. However, several issues that could hinder the practicality of the model were raised by some of the experts. These issues were related to the architecture, the theoretical foundation and the complexity of the model.

- ❖ Extending Rogers' (1983) Model and Ajzen's (1991) TPB

This research simultaneously extended Rogers' (1983) innovation-decision process model and Ajzen's (1991) theory of planned behaviour. Incorporating Ajzen's (1991) TPB into Rogers'

(1983) model constitutes a major extension to the diffusion of innovations theory. Similarly, merging Ajzen's theory with Rogers' innovation decision process model represents a significant extension to the TPB. Besides, 8 new variables were incorporated into the "combined" model, namely: perceived source credibility; perceived argument quality; perceived self-interest; perceived consequences; perceived urgency of change; perceived persuader legitimacy; perceived risk; and communicability. Each of these variables was believed to influence the outcome of the sustainability-diffusion decision process.

The merger between Ajzen's (1991) theory and Rogers' (1983) model and the incorporation of the 8 new variables helped to create a novel sustainability diffusion model. Hence, it was very difficult to find empirical studies whose findings can be easily compared and contrasted with the findings of this thesis. For example, the author could not find any studies that investigate the relationship between perceived persuader legitimacy and continued adoption or how this relationship is mediated by behaviour. Similarly, there are not any studies that examine the impact of perceived urgency on the actualisation and continued adoption of pro-environmental behaviours. Urgency is often studied in the context of organisational change initiatives, but it is rarely investigated in the context of sustainability diffusion.

- ❖ Studying the Rate of Diffusion in the Context of Sustainability

This research could be the only empirical study that has investigated the factors that influence the rate by which pro-sustainability behaviours/initiatives are diffused. The element of time is rarely considered in sustainability research. Besides, there are very few empirical studies that investigate the nature of the relationship between innovative behaviour on the one hand and attitude, intention, behaviour, adoption and diffusion rate on the other hand in the context of sustainability. The most relevant study that the author was able to find is that of Chen (2014). Chen explored the impact of customer innovativeness on their behavioural intention to install solar power systems. Hence, the findings of this research are relatively unique.

- ❖ Improving Our Understanding of the Mediation Effects of Attitude and Intention

This research's findings are distinctively unique in the sense that there are not many, if any at all, studies that investigate the mediation effect of attitude on the relationship between knowledge, relative advantage, compatibility, risk, observability, communicability and trialability on the one hand and on behavioural intention on the other hand. Also, there are not any studies that investigate the mediation effect of attitude on the relationship between observability and later adoption even though there are hundreds of studies that examine the relationship between attitude and behavioural intention in the context of the environment.

Additionally, no empirical investigations were found to examine the mediation effects of intention between perceived self-interest and behaviour; or between perceived self-interest and adoption; or between perceived self-interest and later adoption. On the other hand, this research's findings appear to be consistent with the findings of other behavioural management scholars especially in relation to the mediation effects of intention between subjective norm and perceived behavioural control on the one hand and the behaviour on the other hand.

- ❖ Testing Ajzen's (1991) Theory and Rogers' (1983) Model in Different Scenarios

This research empirically tested Ajzen's (1991) theory of planned behaviour and Rogers' (1983) innovation-decision process model in 3 different, pro-sustainability scenarios, namely: duplex printing; sustainability computing; and sustainability mindset. It empirically validated the interdependent relationships that exist between the different components of Ajzen's theory using structural equation modelling and also confirmed the hypotheses which underlie these relationships. Similarly, Rogers' innovation attributes were thoroughly tested and their impact on different stages of the diffusion process was also validated using SEM.

- ❖ Understanding the Diffusion of Sustainability Mindset in UK Universities

Another characteristic that makes this research distinctively unique is that one of the validation studies investigated the diffusion of sustainability culture/mindset which is an intangible innovation. The study investigated employees' perceptions and attitudes towards sustainability as a lifestyle philosophy and as a workplace mindset. There are not any empirical studies in the sustainability literature that conceptualise sustainability as a workplace mindset. Often scholars study the adoption of pro-environmental behaviours or practices, but they rarely investigate the adoption of sustainability itself as an umbrella concept/philosophy/culture.

- ❖ Gaining an Improved Understanding of Sustainability Diffusion in UK Universities

Two out of three of the validation studies targeted only employees of UK universities. This fact adds further value to the contributions made by this research for several reasons. Firstly, universities and educational institutions, in general, are the disseminators/propagators of pro-sustainability knowledge to businesses and to the society at large. This means that if the employees of UK universities are not pro-sustainability, one should not even expect businesses or members of the society to have a favourable attitude towards the diffusion of sustainability as a solution to the many environmental, social and economic problems. Secondly, most of the participants who took part in Study I and Study III are highly educated which means that their responses to the questionnaires' questions were not necessarily based on assumptions, but are more likely to have been based on facts acquired from increased exposure to pro-sustainability

knowledge. Thirdly, there are not any studies that investigate the diffusion of pro-sustainability behaviours in the context of UK universities. Hence, the context itself is of high academic importance as it improves our understanding of the factors that may, directly or indirectly, influence the diffusion of pro-sustainability initiatives in higher education institutions.

10.11 Theoretical Implications

The findings of this research have several theoretical implications. Firstly, the research conceptualised sustainability as an organisational innovation and this conceptualisation was verified using a Delphi study. The verification of the conceptual link between sustainability and innovation opens a wide door for sustainability researchers to borrow concepts, theories, models and frameworks from the well-established field of innovation diffusion and apply them to sustainability in different scenarios and contexts. In other words, sustainability scholars no longer need to re-invent the wheel in relation to studying the factors that affect the diffusion, adoption and implementation of pro-sustainability behaviours/initiatives. Instead, they use the well-established theories of innovation diffusion as a theoretical foundation and extend them or modify them to meet their specific research needs.

Secondly, this research emphasised the importance of having a holistic approach to studying the diffusion, adoption and implementation of pro-sustainability behaviours. It encourages scholars to simultaneously examine the innovation-specific and person-specific factors or variables that influence the rate by which pro-sustainability initiatives/behaviours are diffused, the speed by which they are adopted and the success probability of their operationalisation.

Thirdly, this research is one of very few attempts, if not the only attempt, to merge Ajzen's (1991) theory of planned behaviour with Rogers' (1983) innovation-decision process model to create a sustainability diffusion model. The merger between the two theories was verified using a Delphi technique and was validated in 3 different scenarios. The validation of the proposed sustainability diffusion model helped to highlight the variables that account for variance in employees' attitudes towards sustainability and their behavioural intention to adopt and actualise pro-sustainability initiatives/behaviours. It is now evidently clear that employees' attitudes towards pro-sustainability initiatives are influenced by perceived relative advantage; perceived compatibility; perceived complexity; and communicability. Employees' behavioural intention also appears to be influenced by the same variables in addition to subjective norm; perceived behavioural control; perceived risk; and observability.

Fourthly, this research demonstrates the importance of studying the antecedent of pro-sustainability behaviours. It used structural equation modelling to confirm the propositions that

the diffusion process of pro-sustainability innovations is path-dependent and that the relationship between employees' attitudes towards pro-sustainability behaviours and the actualisation of those behaviours, is mediated by behavioural intention. This is theoretically important because it informs other researchers that the diffusion of pro-sustainability behaviours passes through a number of sequential stages, starting with attitude and intention and ending with adoption, behaviour and confirmation. There is not a direct relationship between attitude and adoption or between attitude and behaviour.

Fifthly, the originality of this research does not stem from the mere identification of the determinants of sustainability diffusion, but rather from the multi-disciplinary analysis of the subject at hand which draws its arguments from both, the theoretical and empirical literature. It analyses the different forms of innovation and establishes the nature of the link between sustainability and organisational innovation. It also draws on the existing behavioural theories in the field of innovation diffusion to help understand the issues that are central to sustainability adoption. More importantly, it goes beyond the analysis of individuals' or organisations' motives for sustainability adoption towards an improved understanding of how workers' attitudes and perceptions of sustainability can influence the rate of its diffusion. Hence, the arguments made in this thesis complement and add value to, the sustainability implementation research by identifying the factors that have a significant impact on the collective adoption process of sustainability. They also initiate a debate about the applicability of innovation diffusion theories and the theories of behavioural control to sustainability.

Sixthly, there are numerous empirical studies that used the different components of Ajzen's (1991) theory of planned behaviour to predict the adoption of pro-environmental behaviour. Therefore, the findings of this research complement and/or support the findings of other scholars whose investigations validated the components and the architecture of Ajzen's theory. This research tested the structure of Ajzen's theory in 3 different scenarios and found that the theory perfectly explains the nature of the interdependent relationships that exist between the different components of the theory, especially with regards to the relationship between perceived behavioural control and the actualisation of the behaviours in question.

10.12 Practical Implications

The findings of this research have several practical implications. Firstly, two out of the three studies targeted employees of UK universities in an attempt to understand the factors that influence employees' attitudes, perceptions and behavioural intentions in relation to the diffusion, adoption and operationalisation of pro-sustainability behaviours. Therefore, the chairs of sustainability departments, the managers of sustainability initiatives and

environmental officers can use the findings of this research to create a workplace environment that's conducive to the adoption and implementation of pro-sustainability initiatives. This research illuminates the variables that influence university employees' attitudes to sustainability, the interdependent relationship between attitude and behavioural intention and the path-dependent relationship between intention, adoption and the behaviour itself. The research's conclusions also make it very clear that in order to speed up the rate of sustainability diffusion, the managers have to emphasise the relative advantage, the compatibility, the subjective norm and the urgency of the initiatives under implementation and de-emphasise complexities and the risks associated with their operationalisation.

Secondly, the findings of this study would be of great value to environmental campaigners and sustainability communicators. The findings evidently illustrate that the diffusion of pro-environmental initiatives or pro-sustainability practices begins with attitude. Campaigners and communicators need to realise that an employee's attitude towards the adoption of pro-sustainability behaviours is influenced by four key variables, namely: perceived relative advantage; perceived compatibility; communicability of the behaviour; and perceived complexity. Therefore, the campaigners need to focus their communication efforts on demonstrating the relative advantages and the compatibility of the behaviour in relation to the current norms and behaviours. The campaigners must also clear any misconceptions about the complexities and potential implications of adopting a particular behaviour or initiative. Once that's been done, the next step is to create an atmosphere in which social pressure is directed in favour of adopting the behaviour or initiative in question; and foster an environment in which the potential adopters feel confident in their ability to adopt and perform the behaviour. Finally, the campaigners need to create a level of urgency that is sufficient enough to push the potential adopters to decide in favour of adoption and force them to actualise the behaviour.

Thirdly, the conclusions of this research suggest that the only thing that stands between having a favourable attitude towards pro-sustainability behaviour and having the intention to adopt that behaviour is "perceived risk". This finding has serious implications for sustainability consultants and communication strategists. Organisations may abstain from the adoption of pro-sustainability initiatives that are perceived to be risky or from those whose implementation is characterised by a high risk of failure. Similarly, an individual is unlikely to engage in a behaviour that is perceived to be risky or could lead to serious implications. For example, employees are unlikely to switch off their PCs each time they leave their desks if they perceive the behaviour to risk their abilities to finish their work on time or to undermine their abilities to perform their duties conveniently and efficiently. Hence, sustainability consultants and

communication strategists must ensure that all misconceptions about the risks and potential implications of adopting a particular initiative or behaviour are eliminated and that the unit of adoption are well-informed about how these risks and implications can be avoided.

10.13 Limitations of the Study

This research has a few limitations. Firstly, there are many factors that influence people's attitudes and behavioural intentions, but this research only tested and validated a selected few. Therefore, there is a need to incorporate more variables into the proposed sustainability diffusion model to boost its predictive and explanatory powers. Secondly, attitude-based research is commonly criticised for the lack of accuracy and the weakness of the link between self-reported intentions and behaviour. Some scholars complain that there is often a discrepancy between self-reported and actual behaviour especially in research studies that use self-report questionnaires. Thirdly, this research adopted a cross-sectional approach to data collection and the primary data was collected using self-report questionnaires instead of observations. The main problem with the use of self-report measures is the potentially negative influence of social desirability bias on the reliability and validity of the collected data. However, this issue was thoroughly addressed as part of the research methodology. The questionnaires' measurements were all adopted from well-established sources. Fourthly, two out of the three validation studies targeted the employees of UK universities which may raise some concerns about the diversity of the research sample and the generalisability of the research's conclusions. Fifthly, this research did not consider the cognitive variables when examining the person-specific factors that influence the diffusion of pro-sustainability behaviours/initiatives. Instead, the research focused solely on the normative variables.

10.14 Future Research

Further research is needed in a number of areas which include, but not limited to:

- This research targeted UK-based employees and primarily the employees of UK universities. This fact limited the research's generalisability. Therefore, future research needs to target a much more diverse sample. The sample could include the employees of UK and non-UK universities or could target all employees regardless of industry or nationality provided that they perform the pro-sustainability behaviour/practice in question in their workplace.
- The nationality or culture of the participants may have had an effect on their behavioural intentions and their attitudes towards the adoption of pro-sustainability behaviours/initiatives. Therefore, a cross-cultural investigation is needed to find out if

the national culture has any influence on employees' perceptions, attitudes and behavioural intention in relation to the adoption of pro-sustainability practices at work.

- This research used a web-based survey to collect primary data from the target populations. Although this method is very popular in innovation diffusion research, there is a need to incorporate new methods of research such as observation. The use of observations could facilitate the study of pro-sustainability innovation diffusion at the time of its diffusion instead of having to rely on self-reported, past experiences.
- Although the proposed sustainability diffusion model has been thoroughly tested and validated, researchers are encouraged to replicate this research and test the proposed model in the context of other pro-sustainability behaviours/initiatives. Using a much larger sample is also recommended in order to generate much more reliable results and research far more representative conclusions.
- This research did not compare or contrast the perceptions, attitudes and behavioural intentions of the participants based on their jobs and hierarchical positions. It is possible that there is a noticeable difference between employees and managers in relation to their attitudes towards the adoption and implementation of pro-sustainability behaviours/initiatives and also in relation to their perceptions and behavioural intentions. Therefore, further research is needed to explore this difference and examine the extent to which people's hierarchal position influences their attitudes, perceptions and behavioural intentions.

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Appendices

Appendix 1: Antecedents of Sustainability Adoption

Appendix 1.1: Social Variables

The social variables that influence people's decision to adopt or reject pro-environmental behaviours/initiatives include their own norms and the social norms of the group or community to whom they belong (Steentjes et al., 2017). Norm is defined as a set of expectations which define or shape how an individual or a group of people should behave in a particular social situation (Bertoldo and Castro, 2016). Personal norm refers to a person's own set of expectations and beliefs on how the individual should or should not behave (Hynes and Wilson, 2016). A popular argument in the literature suggests that pro-environmental behaviours/initiatives that are consistent with the unit(s) of adoption's personal and social norms diffuse at a much faster rate than behaviours/initiatives that run against the existing norms. Ajzen's (1991) theory of planned behaviour (TPB) purports that subjective norm has a significant influence on individuals' behavioural intentions and ultimately on their decisions to adopt or reject a particular behaviour. Many scholars employed TPB to help understand and explain the behavioural variables that impact upon the adoption of pro-environmental behaviours (e.g. Zhang et al., 2017; Lizin et al., 2017). The overwhelming majority confirms the existence of a significant, directional, positive relationship between subjective norm and people's behavioural intention to adopt pro-environmental behaviours and pro-sustainability innovations (e.g. Greaves et al., 2013; Zhang et al., 2017).

Besides subjective norms, personal norms also influence people's behavioural intentions and their attitudes towards pro-environmental behaviours (Hynes and Wilson, 2016). Nordlund and Garvill (2002) argued that personal norms, as predispositions, can act in favour or against the diffusion and adoption of pro-environmental behaviours. This means that an individual who is predisposed to sustainability is more likely to be willing to embrace new pro-environmental behaviours. Numerous empirical investigations in the literature have confirmed the existence of a significant and a positive relationship between personal norms and the adoption of pro-environmental behaviours (e.g. Ramayah et al., 2012; Hynes and Wilson, 2016; Fornara et al., 2011). However, there are very few studies that examine the nature of the relationship between personal norms and pro-environmental behaviour in a workplace context. There are some scholars who are trying to fill this gap in the literature (e.g. Zhang et al., 2013).

Appendix 1.2: Cognitive Variables

The cognitive variables that are most commonly researched include perceived behavioural control and knowledge/awareness. Scholars seem to believe that increased awareness of environmental problems such as climate change and people's knowledge of how their behaviours contribute to these problems facilitate a change in their attitude which in turn increases their intentions to behave pro-environmentally and/or to embrace pro-sustainability initiatives (e.g. Sadik and Sadik, 2014). In other words, the more people know about sustainability, the more favourable their attitude becomes towards the adoption and enactment of pro-sustainability behaviours. Van Birgelen et al. (2009) explored the relationship between environmental awareness and consumers' purchase decisions. They concluded that consumers' level of environmental awareness has a significant, positive influence on their attitudes towards eco-friendly products.

Perceived behaviour control is also believed to have a significant influence on people's behavioural intentions as well as on the actualisation of pro-environmental behaviours (Oztekin et al., 2017). Behavioural control refers to individuals' confidence in their abilities to perform a particular behaviour (Largo-Wight et al., 2012). Hence, a favourable perception of behavioural control facilitates the adoption and actualisation of new behaviours. There are many studies in the literature that confirm the existence of a positive relationship between perceived behavioural control and the actualisation of pro-environmental behaviours (e.g. Chen and Hung, 2016; Shi et al., 2017). Kaiser and Gutscher (2003) explored the factors that influence people's ecological behaviours and found that perceived behavioural control has a significant, directional and positive influence on the adoption of ecological behaviours. Their findings support the proposition that, as in other contexts, perceived behavioural control has a positive impact on the diffusion of pro-environmental behaviour in the workplace.

Appendix 1.3: Affective Variables

The affective variables are concerned with the attitudes and values that an individual has in relation to the environment. Schwartz (1994) developed a model of basic human values. The model comprises of ten universal values. These values are broadly divided into four main categories, namely: self-enhancement; self-transcendence; conservatism; and openness to change. The values that make up each of these categories influence people's attitudes towards pro-environmental behaviour to a different extent. For example, people who take interest in people of other social circles may be characterised as self-transcendent or altruistic, which means that they are more likely to engage in eco-friendly behaviours than those who do not posses these values (Stern et al., 1999). According to Wall et al., (2007), self-transcendent or

altruistic values have a significant, positive impact on people's personal norms and their attitudes towards the environment, which in turn influences their behavioural intentions to adopt pro-environmental behaviours. A study by Karp (1996) also confirmed the existence of a positive relationship between openness to change and the adoption of eco-friendly behaviours.

There is an interdependent relationship between personal values and attitude. People's values influence their attitudes, which in turn influence their intentions to adopt or reject a pro-environmental behaviour (Everard et al., 2016). There are numerous studies that explore the impact of values on attitude and on behaviour (e.g. Sharma and Jha, 2017). For example, Rioux (2011) explored the nature of the relationship between personal values and the collection of used batteries. The study found that people's pro-environmental values predict their attitudes towards the actualisation of eco-friendly behaviours. In this case, the behaviour was the collection of used batteries.

Appendix 1.4: External Variables

The external factors are concerned with facilities that need to be provided and the conditions that ought to be fostered in order to create an environment that is conductive to sustainability (Nazari et al., 2015). For example, companies should not expect employees to use double-sided printing instead of single-sided printing if the printers themselves do not have the duplex-printing feature. Some external factors are situational in nature which means that the people whom are responsible for the diffusion of pro-environmental behaviours must accommodate for the needs, wants and expectations of different groups of adopters. For example, some people are self-motivated and all they need is the conditions and infrastructure that facilitate the operationalisation of pro-environmental behaviours (Klockner and Oppedal, 2011), while others have to be motivated extrinsically.

The extrinsic motivation can be in the form of reward or punishment (Yousaf et al., 2015). Barr et al. (2001) explored the factors that support or hinder people's participation in household waste management initiatives and found that the easier performing a particular pro-environmental behaviour is made, the more likely people will engage in the actualisation of that behaviour. Another study by Fujii (2006) confirmed that the external conditions under which a pro-environmental behaviour is performed have a significant impact on people's perceptions of complexity and ease of implementation, which in turn influence their attitudes and behavioural intentions to actualise the behaviour in question.

Moreover, Nye and Hargreaves (2010) found that the adoption of pro-environmental behaviours in a workplace environment is far more difficult than in households. They

explained the difference between the two contexts by claiming that people have a greater control over external variables in their homes than they do at work. This means that they have the authority and the ability to change the external conditions in favour of the adoption of pro-environmental behaviours at home, but they cannot do the same at work. It is for this reason Nye and Hargreaves (2010) believe that it is much more difficult to break away from the old, unsustainable routines in the workplace than at home.

The role of leadership in the diffusion of pro-environmental behaviours in the workplace is greatly emphasised in the literature (e.g. Afsar et al., 2016). Ramus and Steger (2000) argued that the success of environmental management efforts, in general and the implementation of pro-sustainability initiatives, in particular, is contingent upon leadership effectiveness. They claim that without the strong support and the continued commitment of top management, the implementation of eco-friendly initiatives will be destined for failure. Wang et al. (2015) also put an emphasis on the role of middle managers as facilitators of change. They argued that middle managers are responsible for changing employees' attitudes towards the adoption and actualisation of pro-environmental behaviours. Hence, the feedback, deliberation and support of middle management are seen as a critical for the successful implementation of eco-friendly initiatives (Ronnenberg et al., 2011).

Moreover, a study by Yen and Yen (2012) also confirmed the positive nature of the relationship between leadership and the successful adoption of pro-sustainability initiatives. Their study found that effective leadership is crucial for successful implementation and operationalisation of green purchasing standards. They concluded that the important role of leaders as change agents cannot be overemphasised.

Appendix 2: Innovation

Appendix 2.1: Defining Attributes of Innovation

Academically, researchers needed a conceptual foundation based on which comparative studies are carried out in search of greater understanding of innovation and the factors that influence its adoption and implementation. The attributes research offered just that. It enabled scholars to make robust generalisations and put forth several theories of innovation diffusion that explain the predictive power of innovations' attributes. Taking the innovation itself as a unit of analysis enabled researchers to adequately categorise and characterise innovations on the basis of their similarities and differences which in turn made it possible to make robust generalisations about their diffusion patterns.

Unfortunately, there is no an authoritative list of innovation attributes that can be used to distinguish an innovation from an invention or separate innovations into different categories. Most of the attributes that have been widely researched in the literature appear to be related to innovation adoption. For instance, a meta-analysis study by Tornatzky and Klein's (1982) investigated 30 different innovation attributes that, directly or indirectly, influence the adoption and implementation of new innovations. Only three attributes were found to have a significant influence on adoption, namely: compatibility, complexity and relative advantage. The significance of these three attributes has been confirmed by other scholars (e.g. Beatty et al., 2001; Thong 1999; Premkumar et al., 1997; Agarwal and Prasad 1997). They are widely used as predictors of innovation adoption (e.g. Schneider, 2007; Boyne et al., 2005).

There are numerous empirical studies that investigate multiple innovation attributes simultaneously. These are categorised as multi-attribute studies. Everett Rogers' (1962) Diffusion of Innovations Theory is the most influential of all in the research field of innovation. Rogers developed a diffusion model that explains the impact of five key attributes on the rate of innovation diffusion. Initially, the five attributes were categorised as: communicability, compatibility, complexity, divisibility and relative advantage. These attributes were altered slightly in later publications. Communicability became observability and divisibility became trialability (Rogers, 2003). The alterations were aimed to address concerns about the descriptive precision of the original constructs. Rogers claimed that the five attributes are the most influential of all and all the other attributes have comparatively insignificant explanatory power in relation to innovations' adoption patterns and rate of diffusion. Rogers' claim was challenged by some scholars such as Tornatzky and Klein (1982) who argued that the five-attribute model provides only a partial explanation for variations in innovations' diffusion rates. King (1992) also raised concerns about Rogers' retrospective approach to the measurement of perceived attributes. King argued that innovations' attributes should be investigated at the time of adoption decisions and not retrospectively in order to accurately gauge the relationship between adopters' perception and the rate of diffusion.

Despite its limitations, Rogers' (1962) work encouraged other scholars to embrace the multi-attribute approach to innovation diffusion research. One example is Fliegel and Kivlin (1966) whose study investigated 15 different attributes in the context of 33 farming innovations. The attributes were believed to influence the diffusion process. They were a combination of general, context-specific and economically-oriented attributes three of which were barrowed from Rogers' work, namely: trialability, compatibility and complexity. Fliegel and Kivlin (1966) indicated that several more innovations could have been included in their study, but

reliability had to be prioritised over scale. Another multi-attribute study was conducted by Dearing and Meyer (1994) in which 11 attributes were investigated in an attempt to create an "innovation profile" and an "attribute matrix" that can facilitate easier and more effective comparison of innovations. Six out of the 11 attributes were inspired by Rogers (1983) work. The study investigated the attributes in the context of both, the innovator and the adopter of the innovation. Their conclusions emphasised that the diffusion process is influenced by both, the perceptions of the adopter and the perceptions of the innovator.

The work of Dearing and Meyer (1994) was advanced further by Meyer et al. (1997) who investigated similar attributes, but in the context of health service innovations. The original attributes underwent further development and two more attributes were added, namely: adaptability and risk. The development was influenced by the work of Dearing et al., (1994) and Rogers (1983). Rogers' Diffusion of Innovations Theory was used to boost the effectiveness of the innovation comparison instruments developed by Dearing and Meyer (1994). The theory made it easier to contrast different innovations on the basis of their attributes. The study found that the attributes of different innovations were configured and perceived differently by the units of adoption. The degree of difference was somewhat consistent with many of Rogers' propositions. For example, it was found that the more observable an innovation is, the less risk it was perceived to carry and the higher the rate of its diffusion. However, the samples involved were context-specific and were relatively small which raises serious doubts about the generalisability of the study's conclusions.

To sum up, it appears that the unit of adoption's perception of innovations' attributes is a classic issue investigated by many innovation diffusion scholars. However, although multi-attribute studies have increased in popularity in recent years, very few studies were found to investigate four or more attributes. The 10 most studied attributes are: trialability, observability, compatibility, relative advantage, complexity, communicability, social approval, profitability, divisibility and cost (e.g. Strömberg et al., 2016; Hayes et al., 2015; Ortega et al., 2007; Sin et al., 2016; Woodside and Biemans, 2006; Aubert et al., 2012; Bozan et al., 2015; Ghisetti and Rennings, 2014; Diaz-Rainey and Ashton, 2015). Out of the 10 attributes, only 3 are considered to have a significant predictive power of innovation diffusion processes, namely: complexity, relative advantage and compatibility.

Appendix 2.2: Perceived Attributes of Innovation

Adopters' perception of an innovation's attributes influences their attitudes towards its adoption (Kapoor et al., 2014; Fallan, 2015). Positive perceptions foster a favourable attitude towards the implementation of new innovations. Scholars have developed several theories and

diffusion models that explain how adopters' perceptions influence their adoption behaviour. Broadly, innovation attributes are divided into two categories, namely: primary (i.e. inherent) and secondary (i.e. perceived) (Downs and Mohr, 1976). The primary attributes are inherent to the innovation itself and do not change with changes in adopters' perceptions or in the adoption context, whereas the secondary attributes change in accordance to changes in adopters' perceptions and situational variables. For example, the cost of a particular innovation is a primary attribute, but buyers' perceptions of whether it is cheap or expensive is a secondary attribute. One customer may perceive an innovation to be good value for money, while others may perceive it to be expensive.

It is this perception that determines the rate by which innovations are diffused. Hence, many studies in the literature have investigated the role perceived attributes play in the diffusion and adoption processes of new innovations (e.g. Al-Sayed and Dugdale, 2016; Häggman, 2009; Saaksjarvi, 2003; Yaacob and Yusoff, 2014; Li and Huang, 2016).

One of the most prominent investigations is that of Rogers and Shoemaker (1971) which identified five perceived attributes, namely: communicability, divisibility, complexity, compatibility and relative advantage. These were later modified by Rogers (1983) to improve their measurement precision and have since become as: observability, trialability, complexity, compatibility and relative advantage. Rogers' work has become the theoretical foundation of most scholarly research that investigates the impact of perceived attributes on the adoption process of new innovations. For example, Gatignon and Robertson (1985) put forth several theoretical propositions which used all of Rogers' (1983) five attributes and only perceived risk was added to the combination. Similarly, a study by Moore and Benbasat (1991) investigated the adoption process of information technology and used four of Rogers' (1983) attributes, namely: relative advantage, compatibility, trialability and observability. Five other attributes were incorporated into the combination, namely: visibility, result demonstrability, ease of use, image and voluntariness. Another study by Frambach et al. (1998) used all of Rogers' (1983) attributes. It investigated the diffusion of electronic banking in Holland. Only "uncertainty" was added to the collection.

Unsurprisingly, there were even studies that embraced all of Rogers' (1983) propositions with minimal or no alterations at all (e.g. Kautz and Larsen, 2000; Aizstrauta et al., 2015; Dibra, 2015). Kautz and Larsen, (2000) studied all of Rogers' five attributes in the context of European IT firms. They investigated the factors that support or hinder the diffusion of process improvement practices. Aizstrauta et al. (2015) also applied all of Rogers' (1983) attributes to study the factors that influence the diffusion and acceptance of technological innovations in

the context of sustainability. Similarly, Dibra (2015) used all of Rogers' (1983) theory and the innovation attributes in particular, to investigate the factors that influence the diffusion and adoption of sustainability practices in the tourism industry. Dibra (2015) found the theory to be a very useful and a suitable theoretical model to study the factors that influence the uptake of sustainable practices in tourism businesses.

Moreover, few studies embraced some, but not all of Rogers' (1983) propositions (e.g. Sultan and Chan, 2000; Kim and Srivastava, 1998). Sultan and Chan (2000) investigated the influence of perceived relative advantage, compatibility and complexity on the diffusion and adoption processes of object-oriented technologies. The study was conducted in the context of U.S. software firms. Similarly, Kim and Srivastava (1998) investigated the factors that influence the diffusion of technology-based innovations in organisations. Their study developed a framework that explains how perceived compatibility, complexity and observability influence the intra-organisational diffusion of technological innovations.

It is common for scholars to integrate some of Rogers' (1983) propositions with their own assumptions, theories, models or frameworks. There are many examples of this (e.g. Gopalakrishnan and Bierly, 2001; Agarwal and Prasad, 2000; Raymond and Blili, 1997; Tabak and Barr, 1998; Premkumar and Roberts, 1999; Wilson et al., 1999). Gopalakrishnan and Bierly, (2001) adopted a theoretical approach to studying innovation diffusion with a focus on knowledge and organisational learning theories. Their empirical investigation studied adopters' perception in relation to two key attributes, namely: cost and complexity. Premkumar and Roberts, (1999) also studied the impact of perceived cost-effectiveness and complexity on the adoption of information technologies, but two more attributes were also investigated, namely: compatibility and relative advantage. Their study focused on America's industrial sectors.

Similarly, Agarwal and Prasad (2000) investigated the adoption of software process innovations by US-based investment banks. Their study focused primarily on three perceived attributes, namely: compatibility, ease of use and relative advantage. A much larger study was carried out by Wilson et al. (1999) who investigated innovation adoption in the context of 70 US-based hospitals. Their study aimed to an adoption framework for technological innovations. However, they only investigated two perceived attributes, namely: relative advantage and radicalness. In contrast, Tabak and Barr (1998) investigated the influence of five perceived attributes on the adoption of organisational innovations in US-based, health care providers. They explored how and to what extent, the diffusion of organisational innovations is influenced by perceived risk, complexity, compatibility, relative advantage and controllability.

A relatively similar study was conducted by Raymond and Blili (1997), but in the context of Canadian SMEs. The study investigated the adoption of electronic data interchange in 15 SMEs and focused primarily on perceived benefits and risk. Under the banner of "risk", other attributes such as perceived cost, complexity and compatibility were investigated. Although different terms were used to define different attributes, three of Rogers' (1983) attributes were evidently present, namely: compatibility, complexity and relative advantage.

There are several studied that investigate the same attributes, but under different banners (e.g. Totterdell et al., 2002; Zhao and Co, 1997; Weiss and Dale, 1998). Totterdell et al. (2002) investigated the influence of innovations' attributes on their perceived impact on organisations' processes and operations. Five attributes were investigated in the context of UK-based industrial firms, namely: relative novelty, magnitude, risk, investment and pervasiveness. If termed differently, "magnitude" becomes complexity, relative novelty becomes compatibility and investment becomes cost. Similarly, Zhao and Co (1997) studied the impact of perceived benefits on the diffusion of manufacturing technologies in Singaporean industrial firms. Arguably, perceived benefits can be used interchangeably with Rogers' (1983) perceived relative advantage. Another study by Weiss and Dale (1998) also introduced a new innovation attribute under the banner of "operational novelty". It is, however, a combination of two of Rogers' (1983) attributes; namely, complexity and compatibility.

Appendix 2.3: Innovation Creation

There are several perspectives on how innovations emerge. Some scholars believe that most innovations are serendipitous in nature; therefore, they are considered to be the outcome of mere chance (Cardellino and Finch, 2006). From this perspective, innovations cannot be deliberately pursued. They can only be retrospectively rationalised (Miller and Osborn, 2008). There are, however, other scholars who believe that innovations are the result of purposive actions and rational intentions (e.g. Nelson and Winter, 1982). The supporters of the purposive perspective believe that innovations often emerge as an outcome of problem-solving processes and in response to deterioration in performance of existing operations, practices or technologies (e.g. Hojnik and Ruzzier, 2016). A decline in performance prompts individuals, teams or organisations to explore different alternatives and find effective solutions that do not only stop the decline, but also boost their performance (Martin-Rios and Parga-Dans, 2016). It is from this process of exploration and identification of sustainable solutions that innovations emerge according to the purposive perspective.

There are other perspectives which are quite similar in their view how innovations emerge to the purposive perspective. These include contingency theory perspective (Burns and Stalker,

1961); population perspective (Hannan and Freeman, 1984); and general systems perspective (von Bertalanffy, 1962). The proponents of the contingency theory perspective argue that the way innovations emerge is contingent upon the type of organisation and the circumstances of the environment in which it operates (e.g. Cheng and Van de Ven, 1996; Al-Sayed and Dugdale, 2016). They claim that although innovations emerge as a result of purposive, rational and adaptive problem-solving activities, the outcome of these activities is significantly influenced by numerous internal and external variables (Drejer, 2002). Similarly, the general systems perspective does not view innovation in isolation. Instead, it is viewed as an element of a wider system which is influenced by numerous interrelated relationships and dependencies (Ganter and Hecker 2014; Iñigo and Albareda, 2016). The larger the system is, the more difficult it becomes to pinpoint and rationalise the factors or variables that contribute to the creation of innovations (Huang et al., 2016a).

In contrast, the proponents of the population perspective argue that innovation is a social phenomenon that occurs from within a population of individuals or organisations whom are engaged in problem-solving activities whereby innovations emerge in the form of solutions to existing problems (e.g. Åkesson et al., 2016). Åkesson et al. (2016) argued that innovations are often "driven by collaborative efforts of the engaged actors; with their operant and operand resources, creating new value propositions and smarter ways of integrating resources and co-creating value". This argument suggests that innovations emerge as a result of a collective and a systematic search for improvement or perfection by organised groups or social actors. Accordingly, Windrum et al. (2016, p. 154) defined innovation as "a novel solution to a social problem that is more effective, efficient, sustainable, or just, than existing solutions and for which the value created accrues primarily to society as a whole rather than to private individuals". This definition also emphasises the problem-driven nature of innovation creation.

Appendix 3: Persuasion

Appendix 3.1: Attitude and Persuasion

It is important to appreciate the significant role attitude plays in persuasion. Persuasion does not occur without a change in attitude. In fact, the primary purpose of any persuasive communication is to change the attitudes of the target audiences about a particular subject, or object. A change in attitude often leads to a change in behaviour. Attitudinal and behavioural entities consist of four elements: action (the behaviour itself), time (at which the behaviour is performed), target (at which the action is directed) and the context (in which the behaviour takes place). A high correlation between attitude and behaviour depends on both entities being

measured at the same level of specificity. Where measures of attitude and behaviour do not correspond in all four elements, high relations cannot be expected.

The relationship between an attitude and a behavioural intention or an attitude and an actual behaviour has been widely discussed for more than 70 years (Fishbein and Ajzen, 1975). Ajzen and Fishbein (1980) referred to attitude as a "set of interrelated predispositions to respond". Attitude guides individuals' manners and behaviours. This means that a preferential behavioural intention or favourable behaviour is conducted because the positive or negative attitude and initial evaluation comes from the belief. Individuals with a stronger positive attitude have a higher intention of performing a specific behaviour. Therefore, the influence from attitude on behavioural intention is positively confirmed.

Effective persuaders tend to target a person's beliefs in their attempts to change his/her attitude towards a particular behaviour. A belief serves as a function to have a specific attitude towards or to perform a particular behaviour. An attitude towards performing behaviour can be influenced by one belief or-a set of beliefs making performing that behaviour correct. Facts show that attitudes are a multiplicative consequence of belief strength and belief evaluation (Bagozzi, 1981). The belief strength is the certainty in which the belief is held in its own right, whereas belief evaluation is the extent or consequence of having a specific belief. These two components of interactive influences form an attitudinal belief and evaluation of having specific attitudes. Once the attitudinal belief is formed, it leads to the intention to perform or not to perform, a specific behaviour. Thereafter, a specific behaviour will be conducted.

Appendix 3.2: Attitude and Intention

In order to better understand why individuals have certain attitudes towards a particular behaviour and particular subjective norms, Ajzen and Fishbein introduced two other constructs to further clarify the conceptual relationship between attitude and behavioural intention, namely: normative beliefs and behavioural belief. Ajzen and Fishbein (1980; p. 7) defined behavioural beliefs as "beliefs that underlie a person's attitude toward the behaviour". In short, a person believing that showing a particular behaviour would lead to good results will hold a positive attitude towards this behaviour and have higher intentions to actualise the behaviour. Normative beliefs, on the other hand, underlie the subjective norms and are defined as one's perceived expectation of how significant others assess performing a particular behaviour (de Leeuw et al., 2015).

However, there were some criticisms raised against Ajzen and Fishbein's (1980) conceptualisation of the relationship between normative beliefs, attitudes, behavioural

intentions and the actualisation of the behaviour in question. Their theory of reasoned action (TRA) was strongly criticised for failing to consider the influence a person's volitional control has on their behaviour (Hale et al., 2002). In response, Ajzen (1991) extended the TRA and introduced the theory of planned behaviour (TPB). Two more constructs were added the new theory, namely: control beliefs and perceived behavioural control (Ajzen, 1991). The changes were based on the argument that an individual might try to perform a particular behaviour but they are not able to do so because of external constraints. These constraints are outside of the sphere of control of that individual, because they are caused by external entities such as time or technology. Hence, it was necessary to incorporate new constructs that take into account the issue of constraints or lack of control. The perceived behavioural control is, therefore, defined as individuals' perception of their ability to perform a particular behaviour (Ajzen, 1991).

Appendix 3.3: Attitude and Actualisation of Behaviours

Conner and Armitage (1998) posited that attitude toward the behaviour may predict intention and behaviour when individuals are both motivated and have the opportunity (high perceived behavioural control). But when one or the other is low, attitude toward the behaviour may either diminish the probability of the behaviour even happening, or may make the behaviour more spontaneous. Therefore, it is vital to ensure that a person's favourable attitude and their intentions to adopt, the behaviour are maintained at an optimal level for as long as necessary.

Ajzen (1991) stated that intentions may change with the passing of time and information newly received. This indicates that it is possible to change the salient beliefs of a person with new information, resulting in a change in the person's intention. Ajzen also observed that time may affect the stability of an intention, thus transforming intention to action should be done in a timely manner. Strength of salient beliefs is also an important factor when relating to intention. For example, if a person has a very strong belief in a particular behaviour, it may be difficult to change the person's intention within a short period of time.

Appendix 3.4: The Elaboration Likelihood Model (ELM)

According to Petty and Cacioppo (1986; p. 128), elaboration is understood as "the extent to which a person thinks about the issue-relevant arguments contained in a message". It facilitates changes in a person's implicit beliefs and personal preferences (Wye, 2016). Depending on the level of a person's elaboration, two different kinds of processing can take place. These different kinds of processing are called routes, namely: the central route and the peripheral route. The central route is characterised by being cognitively effortful, slow and stemming from systematic reasoning (such as logical enquiries). Gu et al. (2016; p. 2) stated that the "central route of information processing involves extensive cognitive efforts, through which

individuals think deliberately in an attempt to uncover all pros and cons of an issue". Conclusions derived via the effortful central route yield long-lasting effects such that the persuasive attempts processed through this route are regarded to be more firmly accepted and therefore, take more effort to subsequently change again.

In contrast, on the peripheral route, there is only a very cursory consideration of the message and its content (Bi eta l. 2017). The receivers build up their opinions or attitudes by relying on superficial cues of the particular message. Instead of careful consideration and detailed examination of the message, the receivers use simpler rules to evaluate the message (Yang, 2015). These rules are called "simple cues" (Petty and Cacioppo, 1986; p. 134) or "simple decision rules" (Perloff, 1993; p. 119), or "heuristic cues" (Chung and Han, 2016; p. 2). The peripheral route is often used by receivers who do not wish to "devote the necessary cognitive energy to elaboration, or they cannot expend the effort" (Chung and Han, 2016; p. 2).

Appendix 3.5: The Theory of Attribution

Attribution theory deals with the common sense way to answer why questions and is concerned with people's perceptions of causality, their judgment of why a particular event happened. In order to understand why individuals behave in certain ways, researchers need to comprehend whether the locus of causality for an event is external (i.e. others caused the event) or internal to the individual (i.e. the person caused the event).

Generally, research on attribution theory is divided between studies that focus on antecedents of causal inferences (i.e. information, beliefs, and motivation) and studies that examine consequences of attributions (i.e. affect, behaviour, and expectancy). The first stream of research involves the systematic study of those factors that determine the individual to attribute the event to a certain cause whereas the second category concerns the consequences of making a particular attribution. These researchers further emphasise the mediating role of attributions between factors of the causal inferences and their consequences.

Attribution research has primarily focused on the determinants and consequences of people's causal ascriptions. Researchers have examined the way people arrive at attributions, or the attitudes resulting from causal inferences. It was documented that attributions significantly impact the way that people communicate and their satisfaction or dissatisfaction with certain objects, actions or behaviours. When people perform a particular behaviour or take a certain course of action, they encounter either a positive or a negative outcome; they further engage in attributional conclusions with regard to the reason of that outcome, which then impacts their affective and behavioural responses (Weiner, 2000).

The fact that individuals' feelings and behaviour are influenced by their causal analysis of various events or outcomes is long documented in socio-psychological studies. Researchers have also demonstrated that the kind of attributions people make impacts on both their affective and behavioural responses. Researchers have generally predicted people's attitudes by examining causal dimensions such as locus of causality, controllability, and stability. For instance, locus of causality determines who is responsible for an outcome such as poor performance, control refers to whether the responsible party had control over the cause of the outcome, and lastly, stability determines whether the cause is likely to happen again. These causal inferences determine attributions of responsibility (i.e., whether the individual or the organisation is responsible for a certain outcome), which are particularly relevant when examining people's reactions (Weiner, 2000).

The relationship between determinants of attributions and causal inferences is also important, as certain information about behaviour and the circumstances in which it occurs are used by an individual to infer the behaviour's cause. Klein and Dawar (2004) demonstrated that CSR beliefs (e.g., positive vs. negative CSR) moderate consumers' perceptions of the causal dimensions of attributions (i.e. locus, controllability, stability). In other words, for those firms who enjoyed a positive corporate social responsibility association, the cause of the product-harm crisis was attributed as more external to the firm, less stable and less controllable by the firm, when compared to those companies that did not enjoy a positive CSR.

Appendix 4: Sustainability as an Innovation

If sustainability is an innovation, what type of innovation is it? Sustainability can fit into different innovation classifications depending upon the context in which it is being investigated. Innovation classification is a key research theme in the innovation literature (e.g. Albers et al., 2016; Burningham and West, 1995). It is believed to play a significant role in the diffusion and adoption processes of innovations (Albers et al., 2016). It has also been employed as a variable in many innovation research studies. In fact, it does not only influence the diffusion of new innovations (Damanpour, 1988), but it also impacts on innovation processes (Fernández, 2001) and innovations' performance (Varis and Littunen, 2010; Danneels and Kleinschmidt, 2001; Oke, 2007). Downs and Mohr (1976) stated that the findings of empirical studies on the diffusion of innovations vary because the key factors affecting the adoption of innovation differ from one study to another.

In an attempt to maintain the consistency of comparisons between research findings, many researchers have emphasised the importance of clarifying the characteristics that differentiate one innovation from another. Hence, several typologies of innovations have been suggested in

the innovation diffusion literature. For example, scholars have identified product versus process, organisation-structure and people innovations, radical versus incremental, programmed versus non-programmed, technical versus administrative, high-risk versus low-risk, continuous versus discontinuous and others (e.g. Hullova et al., 2016).

More broadly, there are three approaches to innovation classification that are commonly used by scholars. Innovations are often classified based on their degree of newness (e.g. Johannessen et al., 2001; Harmancioglu et al., 2009; Koc and Bozdag, 2016), or on their domain of application (e.g. Baba, 2012; Rowley et al., 2011), or on their attributes (e.g. Häggman, 2009; Kapoor et al., 2014). The "degree of newness" classification is amongst the most popular approaches to innovation classification. In this approach, innovations are classified based on the magnitude of change and to what extent an innovation differs from its predecessor. Examples of this approach include, but not limited to: continuous / discontinuous innovations; evolutionary / revolutionary innovations; and incremental / radical innovations.

In contrast, the domain of application approach divides innovations into different functionalities or areas of focus such as: technological / administrative; product / process; and organisational / operational (Baba, 2012). This is quite similar to the attributes approach which is based on the assumption that different innovations have different attributes and distinctive characteristics that differentiate one innovation from another (Adams et al., 1992). Attributes are conceptualised as descriptive properties or qualities that are associated with a particular innovation, but not with others (Filho et al., 2017). Hence, they are considered a useful innovation classification tool. However, the attributes approach is far less popular than the newness approach, even though both approaches rely significantly on adopters' perceptions.

The degree of newness approach can be traced back to the early days of innovation research. It gained its legitimacy from simplified arguments that were based on common-sense, convention and intuition. Early scholars (e.g. Rogers, 1962) found it intuitive to classify innovations based on their perceived newness or degree of change. It was later that scholars began to differentiate innovations based on their area of focus or domain of application. The changes in organisations' social structures and technological advancements is what prompted scholars to begin classifying innovations on the basis of their application (Damanpour, 1988).

The attributes approach has also emerged at the early stages of innovation research. Its popularity gained momentum after the introduction of Rogers' (1962) five-attribute diffusion of innovations framework which was later refined by Rogers and Shoemaker (1971). The framework highlighted the importance of innovations' attributes not only as a classification

tool, but also as predictive variables with significant influence over innovation diffusion processes (Douglas et al., 2016).

Appendix 4.1: Degree of Newness Approach

Newness, as a construct, has been fundamental to understanding innovations and their diffusion processes (Witell et al., 2016). An innovation cannot be so unless it is perceived as new by the unit of adoption. The degree of newness might differ from an innovation to another, but without newness an object, practice or concept is just an imitation. However, despite its significance for the innovation field of research, newness is conceptualised and operationalised differently by different scholars depending upon the context in which it is studied or investigated (e.g. Garcia and Calantone, 2002; Makkonen et al., 2016).

Although there is no consensus in relation to the measurement or definition of newness, scholars largely agree that different innovations have dissimilar dynamics. Hence, the newness approach covers a continuum from incremental and radical to disruptive types of innovations (Wan et al., 2015). The adoption of innovations leads to many changes, not only in the structure of the organisation but also in its functions and practices. Therefore, the spectrum of innovations runs according to the extent of the changes created by adopting an innovation, from disruptive to radical and incremental.

Incremental innovations emerge within the structural boundaries of an organisation (Geiger and Finch, 2016). They result in significant improvement in the existing products, processes or technologies. They carry a much lower financial risk than radical or disruptive innovations (Assink, 2006). In contrast, radical innovations are characterised by an unprecedented level of change (i.e. breakthrough) that results in the transformation of existing markets or the creation of new ones (Leifer et al., 2001). Radical innovations create essential changes in the organisation's functions and activities and represent a significant departure from existing practice, whereas incremental innovations include those which produce minor changes in the existing work practices of the organisation and represent a lesser degree of departure.

However, radical and incremental innovations are not discrete types but two ends of the same continuum. Innovations may range from radical to incremental, depending on the degree of new knowledge involved in the innovation and the extent of change caused by the adoption of that innovation. Many different types of innovation, all located somewhere between radical and incremental, can be found in the literature such as: modular, architectural and intermediate innovations (Germain, 1996).

Some scholars rely on the broader organisational context to differentiate between radical and incremental innovations such as; the extent to which an organisation's authority structure is centralised or decentralised and employees' resistance to the adoption and implementation of new innovations. For example, Zaltman et al. (1973) argued that a high degree of centralisation within an organisation facilitates the adoption of radical innovations and hinders the adoption of incremental innovations. This is explained by the fact that radical innovations' operationalisation often creates fundamental changes in the organisation's work (Story et al. 2014). Accordingly, a high degree of resistance may occur. Hence, centralisation may be required to overcome this resistance. In contrast, incremental innovations involve limited new knowledge and produce minor changes. As a result, resistance is often at a minimal level and decentralisation may be appropriate (Fosfuri and Rønde, 2009).

Comparatively, disruptive innovations significantly transform the demand and needs of existing markets and disrupt their former key players (Assink, 2006). Unlike their radical counterpart, disruptive innovations results in a paradigm shift and a significant departure from existing practices (Paap and Katz, 2004).

However, this approach to innovation classification is arguably overly-simplified. There are situations where it is difficult to categorise an innovation that is not new to an industry or market as "radical" even if it produces fundamental changes and even if these changes are perceived as "breakthrough" by unit of adoption. The adoption of sustainability practices, for example, can lead to fundamental changes in the way a company conducts business and can result in significant improvements in performance (Millar et al., 2012), but it is likely to be controversial to classify sustainability as a "radical" innovation. This is because the perceived newness of sustainability is hindered by the fact that it has already been adopted by many organisations and it being in existence for a long time.

There are some studies in the literature that appear to have embraced a broader view of newness (e.g. Garcia and Calantone, 2002; Damanpour, 1996; Van Lancker et al., 2016). Such studies argue that innovations are complex entities that cannot simply be classified on an incremental-radical continuum. Damanpour (1996) conceptualised newness and categorised innovations based on their perceived degree of departure. The higher the degree of departure is, the more radical an innovation is perceived to be. Similarly, Garcia and Calantone (2002) argued that innovations have numerous inherent qualities that correlate strongly with perceived newness such as discontinuity or degree of departure. The more discontinuous an innovation is at the macro or micro levels, the higher the level of perceived newness becomes.

Appendix 4.2: Domain of Application Approach

The domain of application approach to innovation classification divides innovations into different categories based upon their areas of focus. These categories include, but not limited to: administrative innovations; process innovations; organisational innovations; and product / service innovations (Gopalkrishnan and Damanpour, 1994). Evan, (1966: p. 51) defined administrative innovation as "the implementation of an idea for a new policy pertaining to the recruitment of personnel, the allocation of resources, the structuring of tasks, of authority, of rewards". Administrative innovations are aimed at improving the social system and procedural architecture of organisations (Caldart et al., 2014). The social system defines the relationship between different members of the organisation, while the procedural architecture is concerned with the structures, procedures, roles and rules that govern how power is distributed and how communication is exchanged between organisational members (Dischner, 2015).

Administrative innovations bring about changes in the structure of an organisation or in its administrative processes. They are directly associated with the management of an organisation and indirectly with its basic activities. Hence, they do not contribute directly to the development of new products/services, but they help foster the environment needed to encourage creativity and innovation (Ruiz-Moreno et al., 2016). Administrative innovations are directly related to: resource allocation; personnel management; task structuring; and authority distribution and indirectly related to operational activities.

Administrative innovations are somewhat similar to organisational innovations. Organisational innovation is defined as the adoption and implementation of new or significantly improved business practices, management techniques, workplace organisation, organisational structures, business models or corporate strategic orientations with the aim of minimising administrative costs, increasing productivity, improving business performance or having access to non-tradable assets (OECD, 2005). Liao and Wu (2010; p. 1097) defined organisational innovation more broadly as "the application of ideas that are new to the firm, whether the newness is embodied in products, processes and management or marketing systems".

Organisational innovations are non-technical in nature; hence they are often classified independently from process and product innovations (Le Bas et al., 2015). However, they are often "implemented in order to increase operational efficiency, employees' satisfaction or a firm's innovativeness, whereby it intends to increase a firm's performance by reducing costs (administrative and supplies), improving workplace satisfaction and labour productivity" (Fadil et al. 2016; p. 318). This means that although organisational innovations are non-technical, they affect both; the technical and non-technical parts of an organisation' operations.

A sub-category of organisational innovations is management innovation. Management innovation is defined as a form of organisational change that involves the introduction of novel management activities and practices that constitute an unprecedented departure from the past (Hargrave and Van de Ven, 2006). It is also defined as "the introduction and implementation of an existing or mature management practice, process, structure, or technique that has been successfully implemented elsewhere, aiming to improve organizational performance and further organizational goals" (Lin and Su, 2014: p. 86).

Examples of management innovations include Toyota Production System (Liker, 2004), Multidivisional (M-Form) Organisational Structure (Aghion and Tirole, 1995) and Total Quality Management (Ehigie and McAndrew, 2005). It is not only the perception of newness that makes these management philosophies, innovations. It is also the significant financial, organisation and operational benefits that they bring about. Management innovations are often "intended to further organisational goals" through modernisation of existing management practices, processes, structures and techniques (Birkinshaw et al., 2008, p. 829).

Unlike management innovations, process innovations focus solely the operational side of things. Process innovation is defined as the adoption and implementation of new or significantly improved manufacturing processes or value chain operations (Doran, 2012). This includes all the significant changes in production methods, techniques or equipment with the aim of improving quality, reducing cost and increasing value. They also involve introducing new elements, efficiencies and techniques into an organisation's operations for producing products or rendering services (Chang et al., 2015).

Process innovations are distinctively different from product innovations. Product innovations refer to outputs (products/services) which are produced for the benefit of an organisation's customers or clients (Juliao-Rossi and Schmutzler, 2016). Product innovations include the development of a new product or modification of an existing product by introducing new features to enhance its value. Generally, this product modification tends to occur with greater frequency earlier in a product's life cycle.

Although product and process innovations are classified separately, they are not independent of each other (Kraft, 1990). Undertaking one is likely to influence the outcome of the other. For example, in order for an organisation to manufacture a radically or disruptively innovative product, it may have to make radical changes or significant improvements to its existing production processes (Percival and Cozzarin, 2008). Similarly, significant improvements in

processes provide the organisation with the capabilities needed to produce incremental, radical or even disruptive innovations (Miravete and Pernias, 2006; Martinez-Ros, 2000).

Appendix 4.3: Attributes Approach

Innovations are sometimes classified based on their attributes. This approach to innovation classification has been in existence since the early stages of innovation research. It is based on the argument that innovations have different features, characteristics and psychometric properties and their diffusion processes in different organisations are rarely the same (Tapaninen et al., 2009; Onwezen and Bartels, 2011). McCarthy et al. (2000) defined attributes as descriptive features, qualities and psychometric properties that differentiate an entity from another. Adams et al. (1992) also defined attributes as the qualities or characteristics used to differentiate innovations from one another. Hence, studying innovations' attributes is considered a viable classification strategy.

However, several scholars have complained about the lack of studies that use attributes as a primary mechanism for innovation classification (e.g. Avlonitis et al., 2001). Avlonitis et al. (2001) attributed the issue to the complex and multidimensional nature of some innovations which makes it difficult to use their attributes as basis for their classification. Additionally, some innovations do not have tangible attributes or characteristics (Tushman and Nadler, 1986). This is often the case when products and services are combined together and offered to users as a combined solution. Such offerings do not always exhibit tangible qualities. This makes them rather difficult to classify on the basis of attribute.

Broadly, the attributes research is divided into two primary streams, namely: the process stream (Danneels and Kleinschmidt, 2001) and the conceptual development stream (Shenhar et al., 1995). The process stream of research focuses on investigating the factors that influence the rate of innovation diffusion and the adoption process as a whole. It uses innovations' attributes as independent variables and attempts to predict how a particular attribute might influence the diffusion and adoption processes of the innovation under investigation (Sanni et al., 2013; Agag and El-Masry, 2016). In almost all cases, the impact or influence of an attribute on the diffusion and adoption processes is investigated in the context of units of adoption and in accordance with their perception of the different attributes under investigation (e.g. Dibra, 2015; Hasin and Smith, 2016; Miranda et al., 2016).

The conceptual development stream is somewhat similar to the process stream in terms of using a multidimensional approach to studying innovations' attributes. The earlier attempts to address the consistencies and instabilities found in the results of the later. It focuses primarily

on conceptualising the interdependent correlations between different attributes and their relationship with the outcome of diffusion processes. Rogers' and Shoemaker's (1971) study is one of the most popular studies that conceptualise the impact of different attributes on the diffusion process of newly-adopted innovations. Other studies such as those of Meyer and Johnson (1997); Meyer and Goes (1998); and Agarwal and Prasad (1997) appear to have adopted a similar approach to innovation research. They disaggregated innovations into manageable, individual and interdependent variables or units of analysis which made their classification as well as their operationalisation much easier.

However, there are still some issues that need to be addressed by scholars whose research is classified under the conceptual development stream. Firstly, there is lack of consistency in relation to the measurement criterion and mechanisms used to investigate innovations' attributes. This issue hinders researchers' confidence in the generalisability of results. There is, therefore, a need for constancy within attributes studies in order to boost the comparability of results which will in turn improve scholars' confidence in their generalisability. Without this, one doubts that researchers' understanding of innovations, their attributes and their classification will advance substantially. Secondly, although there are numerous studies in the literature that have adopted a multidimensional and multi-attribute approach to innovation research, the number of attributes investigated at one time is not sufficient. Larger sets of attributes need to be investigated simultaneously in order to draw a clearer picture of how innovations' attributes can be used for classification and predictive purposes. Without this, it is difficult to reach a holistic, generalisable and a thorough understanding of innovation classification let alone innovation diffusion.

Appendix 5: Organisational Innovation

Organisational innovations have different characteristics that differentiate them from other types of innovations especially those of technical nature. Technical innovations are much easier to measure as their improvement efforts focus primarily on the technical components of a system and their impact on existing products, services, technologies and processes is measurable. The clarity of their impact and the concreteness of their outcome facilitate more effective and much faster adoption decisions (Nelson et al., 2004). In contrast, organisational innovations are more concerned with the intangible social systems of organisations than with concrete outputs (Damanpour, 1991; Armbruster et al., 2008). Hence, they are much more difficult to measure, monitor or manage. Their improvement efforts focus on organisational processes and management activities in search for more effective ways of doing things (Ali et al., 2016). For example, Gabris et al. (2001) investigated the impact of senior management's

behaviour on workers' perception of their credibility and the adoption of managerial innovations. Their findings suggest that elected leaders are perceived to be more credible than their appointed counterparts and are therefore, more able to create a favourable attitude towards the adoption of managerial innovations.

Page (2005) studied innovations in the context of public management and found that changes in organisations' managerial approach to service provision facilitate the creation of a creative working environment from within which evolutionary innovations emerge. Another study by Lin and Chen (2007) also found that organisational innovations do not only improve organisations' internal performance, but also transform the newly-implemented changes into sustainable competitive advantages. In other words, although organisational innovations focus primarily on the internal affairs, their impact spans beyond organisational boundaries.

Although organisational innovations are often intangible in nature and comprise primarily of non-technical components, there are situations where an organisational innovation encompasses both, tangible and intangible elements and soft and hard components. Examples of such situations include Total Quality management (TQM); and Toyota Production System (Birkinshaw et al., 2008). Both innovations are classified as organisational innovations by Birkinshaw et al. (2008) even though they comprise of various technical components. This is because they are novel; they are systematic and they often lead to significant changes in the way work is organised and managed. TPS, like sustainability, started off as a philosophy and evolved over the years into a comprehensive management system whose primary aim is to achieve optimal organisational and operational performance. This system is made of a variety of tools and techniques that are designed to provide organisations with the structural and procedural means needed to achieve superior business performance (Marksberry, 2011). Each of these tools and techniques may be considered an innovation in its own right.

However, there are several intrinsic features that can be used to differentiate or distinguish between technical and organisational innovations. These features do not only impact on the outcome of their implementation, but also influence their diffusion and adoption processes (Alänge et al., 1998). One of the key defining features of organisational innovations is their knowledge base (Lyles, 2014). Unlike technical innovations, organisational innovations are characterised by a strong knowledge base. Hence, they are often tacit in nature (Alänge et al., 1998). Their adoption, therefore, involves the acquisition, utilisation and operationalisation of new knowledge. The knowledge base is used to justify and propagate the reasons behind any changes to management policies, strategies, practices or to the structural and procedural architecture that governs the way organisational members interact with one another. On the

other hand, knowledge is intangible and is very difficult to protect by patents as an intellectual property. This fact could, however, discourage senior managers from committing financial and human resources to the implementation and operationalisation of organisational innovations.

Another feature that differentiates organisational innovations from technical innovations is observability. Organisational innovations are less observable than their technical counterparts (Alänge et al., 1998). It is not always easy to identify and quantify the impact of organisational innovations on performance even though their positive influence on organisations' competitiveness is acknowledged by many scholars (e.g. Camisón and Villar-López, 2014; Bolívar-Ramos et al., 2012). The same applies to the cost of their implementation. It is much easier to predict or evaluate the implementation cost of technical innovations than that of organisational innovations (Alänge et al., 1998). This is because the different parts or components that make up organisational innovations are not always tangible (Holmes et al., 2014). In such cases, it is not only difficult to calculate the cost of their implementation, but also difficult to determine their impact on performance, if any at all.

Besides, the cost of adopting an organisational innovation might differ from one organisation to another. This is because unlike in the case of technical innovations, there are no markets or traditional suppliers for organisational innovations. There are, however, consultancy firms that offer advice on the diffusion, adoption and implementation of organisational innovations (Bessant and Rush, 1995). The cost of advice will likely differ from one case to another depending upon the expertise, knowledge, time and effort involved in the consultancy process.

Moreover, there is also a major difference in the scope of impact and magnitude of change between technical and organisational innovations. Organisational innovations' implementation tends to have an impact on a larger number of organisational members than does the implementation of technical innovations (Le Bas et al., 2015). They are also more disruptive as they affect a much broader variety of organisational and operational activities. They also face a higher level of resistance from the affected parties (Teece, 1980). Hence, they require a longer-term commitment from both, managers and employees. This is contrary to technical innovations whose implementation is smaller in magnitude and often requires the support of managers only (Spenley, 1992).

More importantly, the tacit nature of organisational innovations permits subjective interpretations of their drivers, benefits and potential implication (Alänge et al., 1998), whereas the adoption decisions of technical innovations are often based on objective evaluation of the trade-offs between their costs and potential benefits (Bunduchi et al., 2011).

Appendix 5.1: Process of Organisational Innovation

Various studies in the literature have attempted to explore the factors that lead, or contribute, to the creation of organisational innovations (e.g. Birkinshaw et al., 2008; Birkinshaw and Mol, 2006). The creation of new organisational innovations is believed to be influenced by numerous company-specific factors. A study by Birkinshaw et al. (2008) identified four principle factors that influence the creation process of organisational innovations, namely: internal change agents, external change agents, the organisational context and the environmental context. The study, however, does not explain in detail how each factor influences the creation and diffusion process of organisational innovations. It only provides a general conceptualisation of the different factors.

The internal change agents construct is conceptualised as the organisational members who are proactively involved in the creation of, experimentation with and validation of new organisational management innovations (Birkinshaw et al., 2008). In contrast, the external agents construct is conceptualised as individuals who are actively involved in the propagation, promotion and legitimisation of new organisational management innovations. These include academics, entrepreneurs, inventors, management intellectuals, experts and independent consultants whose role is to create interest in, encourage the development of and influence the diffusion processes of new organisational management initiatives (Birkinshaw et al., 2008).

Both, the internal and external change agents have to operate within specific organisational and environmental contexts. The organisational context construct is conceptualised as the social mechanisms, the procedural architecture and structural boundaries that influence the attitudes and behaviours of organisational members (Birkinshaw et al., 2008). The manipulation of the organisational context can create an environment that will either support or hinder the efforts of internal agents to diffuse and implement new organisational management innovations. In other words, having a favourable organisational context will have a positive impact on internal agents' ability to successfully diffuse and operationalise new management initiatives.

Similarly, the environmental context is conceptualised as a set of stimuli that is external to the organisation, but has a significant influence over its strategic agenda and operational priorities (Birkinshaw et al., 2008). It also controls the shape and direction of management discourse and the extent to which external change agents can influence internal affairs. In other words, the competitive variables in the environment in which an organisation operates have a significant impact on organisations' willingness to adopt and operationalise new organisational innovations. There are times when organisations are pressured to embark on a transformative

change journey not by internal or external agents, but by the changes that occur in their competitive environments (Elenurm, 2007).

The model put forth by Birkinshaw et al., (2008) comprised of four key stages, namely: motivation, invention, implementation and theorising and labelling. The first stage (i.e. motivation) is concerned with the drivers that motivate organisations and their members to consider change or consider the adoption of new management initiatives. The motives might differ from one organisation to another. Some organisations may be motivated by senior managers' vision, while others may be driven by competitive forces.

Secondly, the invention stage comprises of trial and error efforts and a variety of experimentation activities that aim to come up with sustainable solutions to persistent organisational problems. It is during this stage that innovative hypothetical management initiatives emerge. These initiatives are trialled and tested and the implications of their implementation are explored before they are passed onto the next stage.

Thirdly, the implementation stage encompasses all activities that take place from after an innovation is tested and trialled up until it is successfully operationalised. This stage is about extracting the value of new innovations and passing it onto consumers in the form of effective and efficient organisational and operational practices.

The final stage is theorizing and labelling. In this stage, newly produced innovations are validated and legitimised by internal and external agents. It is at this stage that the rationale for the adoption and implementation of the new innovation emerges. The innovation is propagated internally and externally in order to boost its legitimacy and set the scene for its mass-adoption. Hence, the labelling of newly created innovations is considered of very high importance (Birkinshaw et al., 2008). Arguably, an innovation's name or label has a significant effect on its acceptability and on the unit of adoption's willingness to embrace it. The label also affects the communicability of the innovation. Appropriately labelled innovations are much easier to mass-communicate which in turn increases their chances of mass-adoption.

Appendix 5.2: Diffusion Process of Organisational Innovations

Innovation diffusion processes are studied extensively in the academic literature (e.g. Kim and Pae, 2014; Wang et al., 2006; Kamrad et al., 2005; Baskerville and Pries-Heje, 2001; Kline, 1985; Anand et al., 2016). The studies do not only investigate the pattern and characteristics of diffusion processes (e.g. Yang and Liu, 2006; Yaacob and Yusoff, 2014), but also the factors that support or hinder these processes (e.g. Pries-Heje et al., 2005; Long et al., 2016). Many studies appear to have focused on the variations in the diffusion patterns that are exhibited by

different innovations (e.g. Reggi et al., 2014). The results of these studies indicate that different innovations diffuse and pass through different innovation-decision processes.

Rogers (2003) defined the innovation decision process as a sequential process through which a unit of adoption passes through a number of path-dependent stages starting with knowledge and ending with implementation and operationalisation of the innovation. Once an individual or an organisation begins to view a particular innovation favourably, the innovation diffusion process gains a huge momentum and moves quickly from the knowledge stage to the implementation and operationalisation stages (Kubeczko et al., 2006).

Rogers claimed that the diffusion process of new innovations begins with recognition of the need for and the urgency of, change and ends with routinisation of change. The unit of adoption, be it an organisation or an individual, has to first recognise that there is a need for a particular innovation and then move on to the diffusion, adoption and implementation stages. The recognition stage involves the collection and conceptualisation of information as well as the acquisition of knowledge in order to create a favourable attitude towards the innovation. Adopters' attitude is influenced by five innovation-specific attributes, namely: observability, relative advantage, compatibility, complexity and trialability (Rogers, 1995).

Observability refers to the degree to which an innovation's results are visible to potential units of adoption (Rogers, 1995). The more observable the benefits of a particular innovation are; the higher rate of its diffusion is likely to be. The rate of diffusion is also affected by an innovation's perceived relative advantage. Relative advantage refers to the extent to which an innovation is perceived to be better than its predecessor. Relative advantage is correlated positively to an individual's attitude towards the adoption of an innovation and to the rate of its diffusion. Similarly, compatibility is positively related to the rate of innovation diffusion. Compatibility refers to the degree to which an innovation is considered to be compatible or consistent with existing practices, routines and belief systems (Rogers, 1995). The more compatible an innovation is, the more likely it will be diffused smoothly and swiftly.

Moreover, trialability also plays an important role in the creation of a favourable attitude towards the adoption of new innovations. Trialability refers to the extent to which an innovation can be experimented with on a limited basis (i.e. piloting) (Rogers, 1995). Innovations that can be trialled are considered to have a higher rate of diffusion than those that cannot be piloted. This is because innovation pilots help to eliminate uncertainty about the probability of success or failure. It also mitigates any perception of complexity. Complexity refers to the extent to which an innovation is perceived to be difficult to use, operate or

understand (Rogers, 1995). The higher the level of perceived complexity is, the slower the rate of diffusion is. In other words, complexity is related negatively to innovation diffusion.

The diffusion of organisational innovations is also influence by the characteristics of the organisation and the characteristics of the individuals that control the social system within that organisation. According to Rogers (2003), there are four organisational characteristics that often influence the rate of innovation diffusion, namely: interconnectedness, formalisation, centralisation and leadership. Rogers also claims that organisational members' characteristics such as tenure and position have a significant influence on the process of innovation diffusion.

Several studies in the literature appear to have reached similar conclusions to those of Rogers. For example, Kimberly and Evanisko (1981) investigated the impact of contextual, organisational and individual variables on the diffusion process of new innovations and found that individuals' and organisations' characteristics do have an effect on the adoption of organisational innovations. Similarly, Lewis and Seibold (1993) explored the organisational and individual factors that impact on the intra-organisational adoption of innovations and reached similar conclusions, but the significance of each factor might differ from one organisation to another.

Several studies have also found that highly formalised organisational behaviour and highly centralised decision-making processes aid the diffusion and adoption of organisational innovations (e.g. Damanpour and Gopalakrishnan, 1998). However, their findings are not generalisable. They only apply to organisational innovations. In fact, the situation is quite the contrary in the context of technical innovations. The adoption of technical innovations is supported more by informal organisational behaviour and decentralised decision-making processes and less by formalisation of behaviour and centralisation of decisional powers.

Moreover, a study by Deffuant et al. (2005) explored how individuals as change agents and opinion leaders influence the process of innovation diffusion. Deffuant et al. (2005) put forth individual-based diffusion framework that emphasises the importance of social opinion and its relationship with individuals' perception of innovations' relative advantage. The study found that innovations with weak or negative social image are much more difficult to diffuse and are more likely to fail than innovations with strong or positive social image. It was found that the social image of an innovation is of more importance and of greater priority than the benefits attributed to the same innovation. In other words, an individual is less likely to adopt an innovation that has a negative social image or that is viewed negatively by opinion leaders even if it promises to bring great benefits to that individual.

The influence of opinion leaders is of greater significance to organisational innovations than technical innovations. The benefits of organisational innovations are less observable and take much longer time to materialise (Ganter and Hecker, 2013). Therefore, the majority of adopters rely on opinion leaders to shape their understanding of the innovation, its characteristics, its benefits and the implications of its adoption and operationalisation. Opinion leaders, as influential change agents, play a very vital role in the creation of a favourable attitude towards the adoption of new innovations among their followers (Berranger et al., 2001; Caldwell, 2003; Cho et al., 2012; Seebauer, 2015). They use their formal positions and interpersonal networks to influence the attitudes and behaviours of others in accordance to their perceptions, opinions, beliefs or personal values.

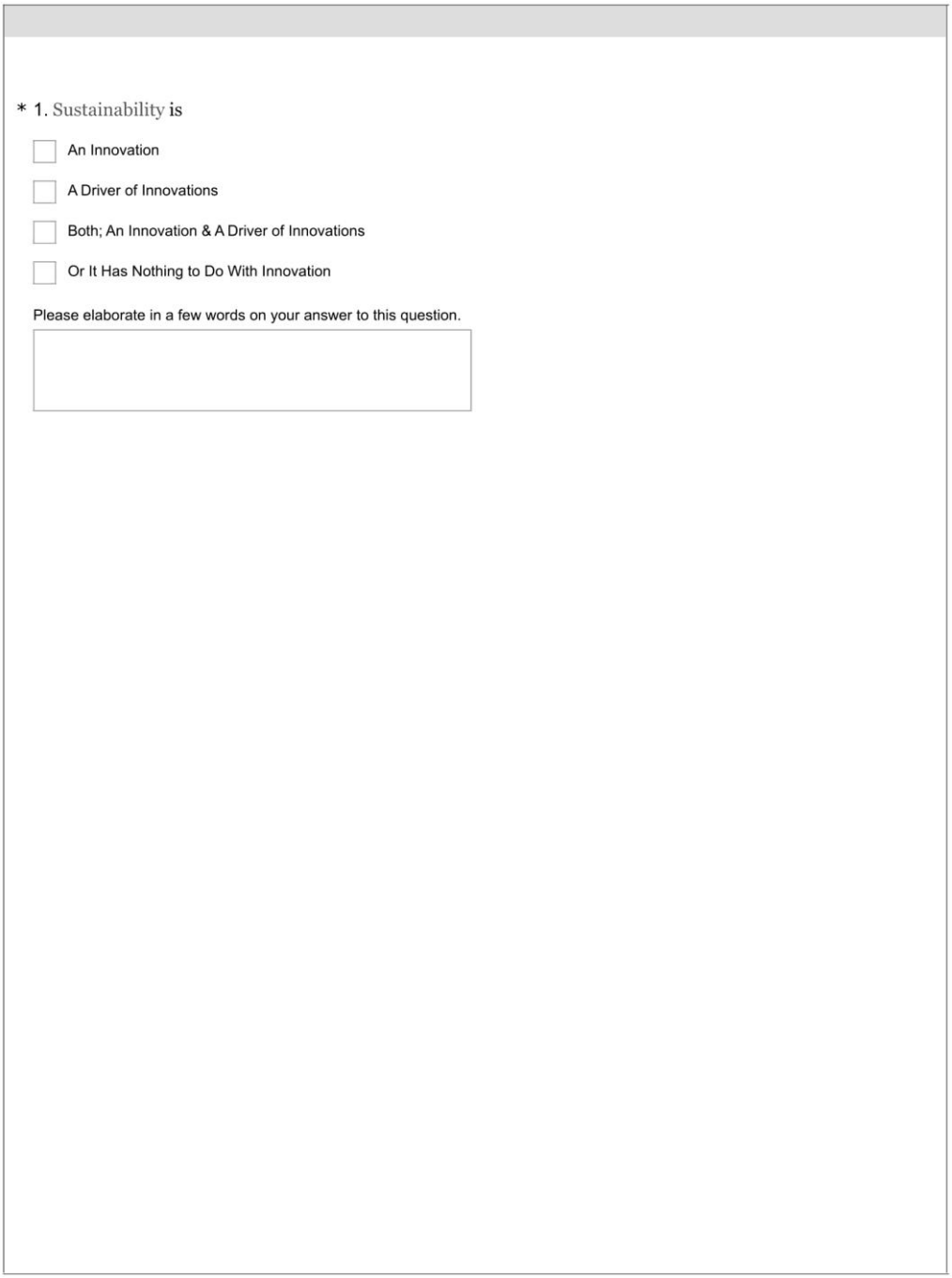
Moreover, opinion leaders have two important roles to pay, namely: the adopter and the innovator. Firstly, they are early adopters of innovations; therefore, their opinions can either encourage or discourage later adopters (Cronje and Moch, 2010). Secondly, they may be the persons responsible for the advent of the innovation (i.e. innovators); therefore, they often act in favour of innovation diffusion and encourage others to support change (Sevcik, 2004).

However, the extent to which opinion leaders can influence the attitudes and behaviours of others is determined by several organisational-level factors such as the interconnectedness that exists within the organisational structure (Young et al., 2001) and the scope of their interpersonal networks (Westphal et al., 1997). The more interconnected the organisational architecture is and the broader the interpersonal networks of opinion leaders are, the greater their influence is. A study by Emmanouilides and Davies (2007) found that the intensity of social interaction between change agents and adopters have a direct effect on the diffusion of new product innovations. Social interaction is seen as a vital channel of communication through which potential adopters become informed about the innovation, its promised benefits and its implications. Similarly, a study by Larsen and Ballal (2005) concluded that informal networks play an important role in the diffusion of innovations.

Nelson et al. (2004) also found that network effects have a significant influence on the speed by which innovations are diffused and adopted. Networks make it possible for early adopters to demonstrate the relative advantage of an innovation to and share their experiences with, later adopters (McMichael and Shipworth, 2013). They also provide laggards with the opportunity to observe the consequences of adopting a particular innovation which will in turn encourage them to embrace a more favourable attitude towards its adoption.

Appendix 6: Delphi Study Questionnaire

❖ Round 1 Questionnaire



* 1. Sustainability is

- [ ] An Innovation
- [ ] A Driver of Innovations
- [ ] Both; An Innovation & A Driver of Innovations
- [ ] Or It Has Nothing to Do With Innovation

Please elaborate in a few words on your answer to this question.

* 2. Please rate the level of your agreement with the following statements.

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Sustainability Is New	○	○	○	○	○	○	○
Sustainability Is Useful.	○	○	○	○	○	○	○
Sustainability is Advantageous.	○	○	○	○	○	○	○
Sustainability Is Commercially Viable.	○	○	○	○	○	○	○
Sustainability Leads to Significant Improvements.	○	○	○	○	○	○	○
Sustainability Is a Connotation of Change or Leads to Change.	○	○	○	○	○	○	○
Sustainability Is a Connotation of Success or Leads to Success.	○	○	○	○	○	○	○
Sustainability Has Revolutionized The Way Things Are Done At Work.	○	○	○	○	○	○	○
Sustainability Is a Large Departure From Existing Working Practices.	○	○	○	○	○	○	○
Sustainability Is Different From Other Environmental Management Systems.	○	○	○	○	○	○	○
The Adoption and Implementation of Sustainability Initiatives Involves a Certain Degree of Risk.	○	○	○	○	○	○	○

If You Have Given a Low Rating for Any of the Statements, Please Explain Why.

3. If you think sustainability is an innovation, what type of innovation is it?

- [ ] Management Innovation
- [ ] Organizational Innovation
- [ ] Administrative Innovation
- [ ] Technical Innovation
- [ ] Marketing Innovation
- [ ] Ideological Innovation
- [ ] Product Innovation
- [ ] Process Innovation
- [ ] Paradigm Innovation
- [ ] Service Innovation
- [ ] Manufacturing Innovation
- [ ] Modular Innovation
- [ ] Incremental Innovation
- [ ] Radical Innovation
- [ ] Architectural Innovation
- [ ] Technological Innovation
- [ ] All of The Above
- [ ] None of The Above

Other (please specify)

* 4. If sustainability is an innovation, is it justifiable to use Rogers' (1983) Diffusion of Innovations Theory, and the Innovation-Decision Process Model in particular (as shown in the figure below), to help understand the factors that influence the rate of sustainability diffusion?

Rogers' (1983) Innovation-Decision Process Model

* 5. We think that Rogers' (1983) Innovation-Decision Process Model fails to pay adequate attention to the person-specific factors that influence the rate of sustainability diffusion. Therefore, we decided to incorporate Ajzen's (1991) Theory of Planned Behaviour into Rogers' Model to help us capture the full picture and enable us to study the person-specific and innovation-specific factors simultaneously. Are we right in doing so from a theoretical and a conceptual point of view? What's your opinion on this?

Ajzen's (1991) Theory of Planned Behaviour

* 6. Please rate the level of your agreement with the following statements.

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Rogers' (1983) Innovation-Decision Process Model Is a Valid Model To Use To Study the Sustainability-specific Factors That Influence the Rate of Sustainability Diffusion	○	○	○	○	○	○	○
Ajzen's (1991) Theory of Planned Behaviour Is a Valid Theory To Use To Study the Behavioural Factors That Influence the Rate of Sustainability Diffusion	○	○	○	○	○	○	○
Incorporating Ajzen's (1991) Theory of Planned Behaviour into Rogers' (1983) Innovation-Decision Process Model To Create a Sustainability Diffusion Model Is Justifiable	○	○	○	○	○	○	○

If You Have Given a Low Rating for Any of the Statements, Please Explain Why.

* 7. In addition to incorporating Ajzen's (1991) Theory of Planned Behaviour into Rogers' (1983) Innovation-Decision Process Model, we have added 8 new factors into the new model. The new factors are marked in RED. Are there any other factors that you think should be added to our model to make it more holistic and generalisable? Or, are there any factors that you think should be removed from the model?

* 8. We don't believe that Trialability and Observability of an Innovation are "PERCEIVED" characteristics as Rogers (1983) claims. We think they are "INHERENT" characteristics. For instance, the benefits of an innovation are either observable or non-observable. Similarly, an innovation can either be trialed/piloted or it can't. It is not about perception. What's your opinion on this? Do you think Trialability and Observability should be put into a separate category under the banner of Inherent Characteristics or should they remain under the banner of Perceived characteristics?

* 9. Please rate the level of your agreement with the following statements.

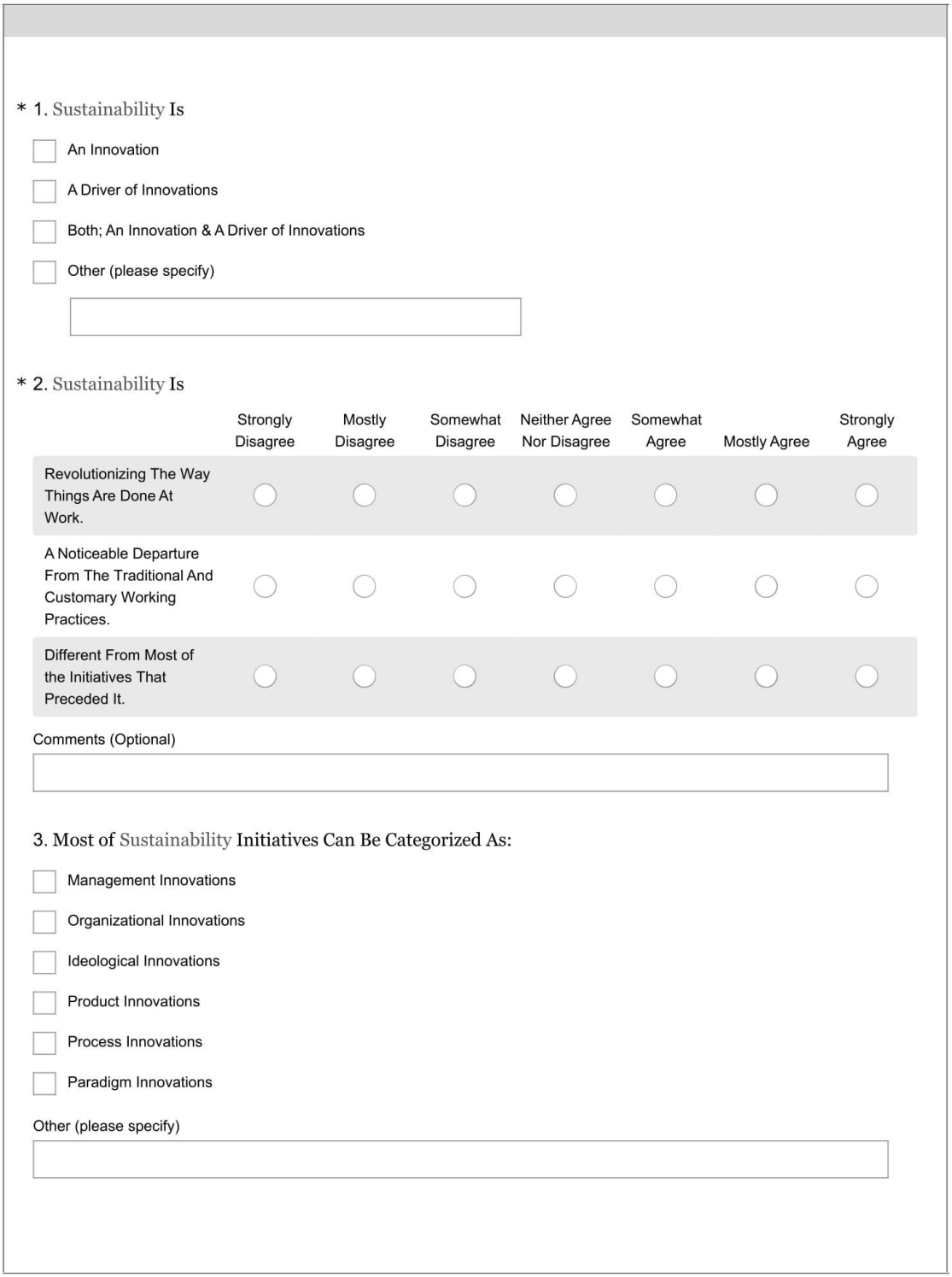
	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
A Positive Perception of the Credibility of the Source of Pro-sustainability Messages Helps To Induce a Favourable Attitude Towards Sustainability Adoption.	○	○	○	○	○	○	○
A Positive Perception of the Argument Quality of Pro-sustainability Messages Helps To Induce a Favourable Attitude Towards Sustainability Adoption.	○	○	○	○	○	○	○
A Positive Perception of Personal Gains (Material or Non-Material Gains) From Sustainability Helps To Induce a Favourable Attitude Towards Sustainability Adoption.	○	○	○	○	○	○	○

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
A Perceived Risk of Failure of a Sustainability Initiative Has a Negative Impact On individuals' Attitudes Towards the Adoption of That Initiative.	○	○	○	○	○	○	○
Communicability of Sustainability Initiatives Facilitates their Mass Adoption	○	○	○	○	○	○	○
If Non-adoption of A Particular Sustainability Initiative Is Associated With Negative Consequences Such As Hindered Promotion Chances, Employees Will Be More Inclined To Adopt It.	○	○	○	○	○	○	○
Creating a True Sense of Urgency of Climate Change Helps To Induce a Favourable Attitude Towards Sustainability Adoption.	○	○	○	○	○	○	○
Individuals Are More Likely to Be Persuaded of The Need For Sustainability By a Person Whom They Perceive to Have a Legitimate Right to Influence Their Opinions.	○	○	○	○	○	○	○
Trialability Is Not a Perceived Characteristic of Innovation. It Is an Inherent Characteristic.	○	○	○	○	○	○	○
Observability Is Not a Perceived Characteristic of Innovation. It Is an Inherent Characteristic.	○	○	○	○	○	○	○

If You Have Given a Low Rating for Any of the Statements, Please Explain Why.

* 10. Please enter your email address.

❖ Round 2 Questionnaire



* 1. Sustainability Is

- [ ] An Innovation
- [ ] A Driver of Innovations
- [ ] Both; An Innovation & A Driver of Innovations
- [ ] Other (please specify)

* 2. Sustainability Is

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Revolutionizing The Way Things Are Done At Work.	○	○	○	○	○	○	○
A Noticeable Departure From The Traditional And Customary Working Practices.	○	○	○	○	○	○	○
Different From Most of the Initiatives That Preceded It.	○	○	○	○	○	○	○

Comments (Optional)

3. Most of Sustainability Initiatives Can Be Categorized As:

- [ ] Management Innovations
- [ ] Organizational Innovations
- [ ] Ideological Innovations
- [ ] Product Innovations
- [ ] Process Innovations
- [ ] Paradigm Innovations

Other (please specify)

* 4. It Is Justifiable To

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Use Rogers' (1983) Innovation-Decision Process Model To Study the Sustainability-specific Factors That Influence the Rate of Sustainability Diffusion	○	○	○	○	○	○	○
Use Ajzen's (1991) Theory of Planned Behaviour To Study the Behavioural Factors That Influence the Rate of Sustainability Diffusion	○	○	○	○	○	○	○
Incorporate Ajzen's (1991) Theory of Planned Behaviour Into Rogers' (1983) Innovation-Decision Process Model To Create a Holistic Sustainability Diffusion Framework	○	○	○	○	○	○	○

Comments (Optional)

* 5. Please Rate The Level of Your Agreement With The Following Statements.

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
If a Sustainability Initiative Is Perceived To Be Risky or Disruptive, It Is Unlikely To Be Adopted By Employees.	○	○	○	○	○	○	○
If Non-adoption of A Particular Sustainability Initiative Is Linked Directly To Negative Consequences Such As Reduced Bonuses or Hindered Chances of Promotion, Employees Will Take It Much More Seriously.	○	○	○	○	○	○	○

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Creating a True Sense of Urgency of Climate Change Helps To Induce a Favourable Attitude Towards The Adoption of Sustainability Initiatives.	○	○	○	○	○	○	○
An Individual's Personal Values Determine His/Her Behaviour and Attitude Towards The Adoption of Sustainability Initiatives.	○	○	○	○	○	○	○
People Participate In Sustainability Initiatives Not Necessarily for Personal Gain, But Mostly Out of Altruism	○	○	○	○	○	○	○
Increased Awareness and Knowledge of Sustainability Helps To Foster A Favourable Attitude Towards The Adoption of Sustainability Initiatives.	○	○	○	○	○	○	○
An Individual's Attitude Towards Sustainability Influences His/Her Knowledge Gathering Behaviour and Vice Versa.	○	○	○	○	○	○	○

Comments (Optional)

6. How Many Years of Experience Do You Have?

- ○ 1-2 years
- ○ 3-5 years
- ○ 6-10 years
- ○ 11-15 years
- ○ 16-20 years
- ○ Over 20 years
- ○ Other (please specify)

7. Do You Consent For Your Name Being Mentioned In Our Internal Reports And/Or External Publications?

- ◯ Yes, I Consent.
- ◯ No, I Would Like To Remain Anonymous.
- ◯ Other (please specify)

* 8. Please Enter Your Email Address.

Appendix 7: Diffusion of Duplex Printing Questionnaire

As an informed participant of this research study, I understand that:

1. My participation is voluntary and I may cease to take part in this research study at any time and without giving a reason.
2. All data will be stored anonymously once it has been collected. This means that it will be impossible to trace information back to me. As such, if I decide I want to withdraw my data from this study, I will be able to do so within 4 weeks from the date of participation. If I decide to withdraw my data, I should contact Mr Khaled Hader directly at: k.hader@derby.ac.uk.
3. All information appearing in the final report will be anonymous. This means there will be nothing that will enable people to work out what I said.
4. This research has been approved by the University of Derby's Ethics Committee. This means it has been approved by a panel of professionals to make sure it meets high standards.
5. All my questions about the study have been satisfactorily answered and I am aware of what my participation involves.
6. Mr Khaled Hader will treat my participation in this study confidentially and anything I say in the survey is considered extremely confidential.

1. I Have Read and Understood the Above, and Agree to Take Part:

Name (Optional)

Date

* 2. Age

- 16-19
- 20-25
- 26-30
- 31-36
- 37-44
- 45-50
- 51-59
- 60 or above.

* 3. Gender

- Male
- Female
- Other (please specify)

* 4. Education

- ◯ Secondary
- ◯ Diploma
- ◯ Bachelor Degree
- ◯ Masters Degree
- ◯ PhD
- ◯ Professorship

* 5. Work Experience

- ◯ Less than 1 year
- ◯ 1-2 years
- ◯ 3-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ Over 20 years

* 6. Position

- ◯ Senior Management
- ◯ Middle Management
- ◯ Line Management
- ◯ Employee

* 7. Do you print on both sides of paper?

- ◯ Yes (If Yes, Please Go To Question 8)
- ◯ No (If No, Please Go To Question 9)
- ◯ Other (please specify)

8. Do you intend to continue using double-sided printing?

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Other (please specify)

9. Do you intend to use double-sided printing in the future?

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Other (please specify)

* 10. Attitude

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Double-sided printing is a responsible behaviour.	◯	◯	◯	◯	◯	◯	◯
Double-sided printing is good for the environment.	◯	◯	◯	◯	◯	◯	◯
I think I should print on both sides of paper whenever is possible.	◯	◯	◯	◯	◯	◯	◯

Comments (Optional)

* 11. Subjective Norm

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
It is expected of me to use double-sided printing whenever is possible.	○	○	○	○	○	○	○
Most people whose opinion I value won't approve of me using single-sided printing.	○	○	○	○	○	○	○
Most people whom are important to me think I should use double-sided printing.	○	○	○	○	○	○	○

Comments (Optional)

* 12. Perceived Behavioural Control

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
I find it easy to get computers & printers to do what I want them to do.	○	○	○	○	○	○	○
I am confident that if I wanted, I could print on both sides of paper all the time.	○	○	○	○	○	○	○
It is totally up to me whether to use single-sided or double-sided printing.	○	○	○	○	○	○	○

Comments (Optional)

* 13. Intention

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
I will avoid using single-sided printing whenever is possible.	○	○	○	○	○	○	○
My intention to use double-sided instead of single-sided printing is strong.	○	○	○	○	○	○	○

Comments (Optional)

* 14. Behaviour

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
I routinely and regularly use double-sided printing.	○	○	○	○	○	○	○
I use double-sided printing whenever is possible.	○	○	○	○	○	○	○

Comments (Optional)

* 15. Confirmation

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
For me, printing on both sides of paper has become a habit.	○	○	○	○	○
Where I work, double-sided printing has become the norm.	○	○	○	○	○

Comments (Optional)

* 16. Perceived Relative Advantage

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Double-sided printing is better than single-sided printing.	○	○	○	○	○
It takes the same time to print double-sided, but less paper.	○	○	○	○	○
Double-sided printing is more cost-effective than single-sided printing.	○	○	○	○	○

Comments (Optional)

* 17. Perceived Complexity

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
It is difficult to get the printer to print double-sided.	○	○	○	○	○
Double-sided printing requires too much mental effort.	○	○	○	○	○

Comments (Optional)

* 18. Trialability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Double-sided printing is trialable.	○	○	○	○	○
I have trialled double-sided printing before.	○	○	○	○	○

Comments (Optional)

* 19. Perceived Compatibility

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Double-sided printing is consistent with my working habits.	○	○	○	○	○
Double-sided printing is compatible with the nature of my work.	○	○	○	○	○
Double-sided printing is aligned with my moral values and personal beliefs.	○	○	○	○	○

Comments (Optional)

* 20. Observability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The benefits of double-sided printing are observable.	○	○	○	○	○
I have observed my colleagues use double-sided printing before.	○	○	○	○	○

Comments (Optional)

* 21. Communicability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I can easily communicate to others why double-sided printing is important.	○	○	○	○	○
I would have no difficulty telling others about the benefits of double-sided printing.	○	○	○	○	○

Comments (Optional)

* 22. Perceived Risk

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Double-sided printing could make a bad impression of my work's quality.	○	○	○	○	○
Double-sided printing could negatively affect the readability and presentation of my work.	○	○	○	○	○
Double-sided printing is more likely to cause paper jam than single-sided printing.	○	○	○	○	○

Comments (Optional)

* 23. Perceived Source Credibility

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I consider the source from which I heard about double-sided printing to be an expert.	○	○	○	○	○
I consider the source from which I heard about double-sided printing to be trustworthy.	○	○	○	○	○

Comments (Optional)

* 24. Perceived Argument Quality

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The pro double-sided printing arguments are strongly convincing.	○	○	○	○	○
The pro double-sided printing arguments are clear and informative.	○	○	○	○	○
The pro double-sided printing arguments are relevant and applicable to my workplace.	○	○	○	○	○

Comments (Optional)

* 25. Perceived Self Interest

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Double-sided printing gives me a feeling of moral righteousness.	○	○	○	○	○
Printing on both sides of paper improves my reputation.	○	○	○	○	○
Using double-sided instead of single-sided printing boosts my professional image.	○	○	○	○	○

Comments (Optional)

* 26. Perceived Consequences

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Unsustainable printing tarnishes my reputation.	○	○	○	○	○
My colleagues would judge me if I use single-sided printing.	○	○	○	○	○
Unsustainable printing distorts my professional image.	○	○	○	○	○

Comments (Optional)

* 27. Perceived Urgency

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Sustainable printing is of pressing importance.	○	○	○	○	○
Sustainable printing is needed now, not eventually, not when it fits easily into a schedule.	○	○	○	○	○

Comments (Optional)

* 28. Perceived Persuader Legitimacy

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am encouraged to use double-sided printing by (a) person(s) whom I consider to have organisational legitimacy.	○	○	○	○	○
I am encouraged to use double-sided printing by (a) person(s) whom I consider to have a legitimate right to influence my behaviour.	○	○	○	○	○

Comments (Optional)

* 29. Knowledge

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am well-informed about double-sided printing.	○	○	○	○	○
I have a good understanding of how double-sided printing works.	○	○	○	○	○

Comments (Optional)

* 30. When did you start using double-sided printing?

- ◯ Less Than a Year Ago
- ◯ 1-2 Years Ago.
- ◯ 3-5 Years Ago.
- ◯ 6-10 Years Ago.
- ◯ More Than 10 Years Ago.
- ◯ I Have Not Started Yet, But I Intend to Start In a Year's Time.
- ◯ I Have Not Started Yet, But I Intend to Start In 2-3 Years Time.
- ◯ I Have Not Started Yet, But I Intend to Start In 4-5 Years Time.
- ◯ I Have Not Started Yet and I Have No Intention to Do So.
- ◯ Other (please specify)

* 31. Personal Behaviour

- ◯ I am venturesome and eager to be the first to try pro-environmental initiatives.
- ◯ I adopt pro-environmental initiatives and influence others to do so.
- ◯ I am willing to follow the lead of others in adopting pro-environmental initiatives.
- ◯ I need to be convinced of the benefits of a pro-environmental initiative before I adopt it.
- ◯ I am usually suspicious of new initiatives and I prefer to maintain the status quo.

32. Email Address

(Confidential! Only Used for Response Identification)

33. Do you wish to know the results of this survey?

- ◯ Yes
- ◯ No

Appendix 8: Diffusion of Sustainable Computing Questionnaire

As an informed participant of this research study, I understand that:

1. My participation is voluntary and I may cease to take part in this research study at any time and without giving a reason.
2. All data will be stored anonymously once it has been collected. This means that it will be impossible to trace information back to me. As such, if I decide I want to withdraw my data from this study, I will be able to do so within 4 weeks from the date of participation. If I decide to withdraw my data, I should contact Mr Khaled Hader directly at: k.hader@derby.ac.uk.
3. All information appearing in the final report will be anonymous. This means there will be nothing that will enable people to work out what I said.
4. This research has been approved by the University of Derby's Ethics Committee. This means it has been approved by a panel of professionals to make sure it meets high standards.
5. All my questions about the study have been satisfactorily answered and I am aware of what my participation involves.
6. Mr Khaled Hader will treat my participation in this study confidentially and anything I say in the survey is considered extremely confidential.

1. I Have Read and Understood the Above, and Agree to Take Part:

Name (Optional)

Date

* 2. Age

- 16-19
- 20-25
- 26-30
- 31-36
- 37-44
- 45-50
- 51-59
- 60 or above.

* 3. Gender

- Male
- Female
- Other (please specify)

* 4. Education

- ◯ Secondary
- ◯ Diploma
- ◯ Bachelor Degree
- ◯ Masters Degree
- ◯ PhD
- ◯ Professorship

* 5. Work Experience

- ◯ Less than 1 year
- ◯ 1-2 years
- ◯ 3-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ Over 20 years

* 6. Position

- ◯ Senior Management
- ◯ Middle Management
- ◯ Line Management
- ◯ Employee

* 7. Do you turn your PC off whenever not in use?

- ◯ Yes (If Yes, Please Go To Question 8)
- ◯ No (If No, Please Go To Question 9)
- ◯ Other (please specify)

8. Do you intend to continue turning your PC off whenever not in use?

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Other (please specify)

9. Do you intend to make a habit of turning your PC off whenever not in use in the future?

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Other (please specify)

* 10. Attitude

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Turning a PC off when not in use is a responsible behaviour.	◯	◯	◯	◯	◯	◯	◯
Turning a PC off when not in use is good for the environment.	◯	◯	◯	◯	◯	◯	◯
I think I should turn my PC off whenever not in use.	◯	◯	◯	◯	◯	◯	◯

Comments (Optional)

* 11. Subjective Norm

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
It is expected of me to turn my PC off whenever not in use.	○	○	○	○	○	○	○
Most people whose opinions I value won't approve of me leaving my PC on when not in use.	○	○	○	○	○	○	○
Most people whom are important to me think I should turn my PC off whenever not in use.	○	○	○	○	○	○	○

Comments (Optional)

* 12. Perceived Behavioural Control

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Turning my PC off and back on is easy.	○	○	○	○	○	○	○
I am confident that if I wanted, I could turn my PC off whenever not in use.	○	○	○	○	○	○	○
It is totally up to me whether I turn my PC off or leave it on when not in use.	○	○	○	○	○	○	○

Comments (Optional)

* 13. Intention

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
I intend to never leave my PC on when not in use.	○	○	○	○	○	○	○
My intention to turn my PC off when not in use is strong.	○	○	○	○	○	○	○

Comments (Optional)

* 14. Behaviour

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
I routinely and regularly turn my PC off whenever not in use.	○	○	○	○	○	○	○
I turn my PC off whenever is possible.	○	○	○	○	○	○	○

Comments (Optional)

* 15. Confirmation

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Turning my PC off when not in use has become a habit.	○	○	○	○	○	○	○
Where I work, turning PCs off when not in use is the norm.	○	○	○	○	○	○	○

Comments (Optional)

* 16. Perceived Relative Advantage

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Turning my PC off when not in use is better than leaving it on.	○	○	○	○	○
Turning a PC off when not in use is more cost-effective than leaving it on.	○	○	○	○	○
The benefits of turning a PC off when not in use outweigh the mental effort of turning it back on.	○	○	○	○	○

Comments (Optional)

* 17. Perceived Complexity

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Turning my PC off and back on is difficult.	○	○	○	○	○
Turning my PC off and back on requires too much mental effort.	○	○	○	○	○

Comments (Optional)

* 18. Trialability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Turning a PC off whenever not in use can be trialled.	○	○	○	○	○
I have trialled turning my PC off whenever not in use before.	○	○	○	○	○

Comments (Optional)

* 19. Perceived Compatibility

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Turning my PC off when not in use is consistent with my working habits.	○	○	○	○	○
Turning my PC off when not in use is compatible with the nature of my work.	○	○	○	○	○
Turning my PC off when not in use is aligned with my moral values and personal beliefs.	○	○	○	○	○

Comments (Optional)

* 20. Observability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have observed my colleagues turn their PCs off whenever not in use before.	○	○	○	○	○
The positive psychological effect of turning my PC off when not in use is observable.	○	○	○	○	○

Comments (Optional)

* 21. Communicability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I can easily communicate to others why turning their PCs off when not in use is important.	○	○	○	○	○
I would have no difficulty telling others about the benefits of turning their PCs off when not in use.	○	○	○	○	○

Comments (Optional)

* 22. Perceived Risk

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My performance would deteriorate if I turn my PC off whenever I leave my desk.	○	○	○	○	○
I would lose track of my work if I turn my PC off every time I leave my desk.	○	○	○	○	○
Turning my PC on and off frequently would damage it.	○	○	○	○	○

Comments (Optional)

* 23. Perceived Source Credibility

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I consider the source from which I heard about the benefits of turning a PC off when not in use to be an expert.	○	○	○	○	○
I consider the source from which I heard about the benefits of turning a PC off when not in use to be trustworthy.	○	○	○	○	○

Comments (Optional)

* 24. Perceived Argument Quality

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The arguments for turning a PC off whenever not in use are strongly convincing.	○	○	○	○	○
The arguments for turning a PC off whenever not in use are clear and informative.	○	○	○	○	○
The arguments for turning a PC off whenever not in use are relevant and applicable to my workplace.	○	○	○	○	○

Comments (Optional)

* 25. Perceived Self Interest

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Turning my PC off when not in use gives me a feeling of moral righteousness.	○	○	○	○	○
Sustainable computing improves my reputation.	○	○	○	○	○
Sustainable computing boosts my professional image.	○	○	○	○	○

Comments (Optional)

* 26. Perceived Consequences

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Unsustainable computer use tarnishes my reputation.	○	○	○	○	○
My colleagues would judge me if I leave my PC on when not in use.	○	○	○	○	○
Unsustainable computer use distorts my professional image.	○	○	○	○	○

Comments (Optional)

* 27. Perceived Urgency

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Turning a PC off when not in use is of pressing importance.	○	○	○	○	○
Sustainable computing is needed now, not eventually, not when it fits into a schedule.	○	○	○	○	○

Comments (Optional)

* 28. Perceived Persuader Legitimacy

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am encouraged to turn my PC off whenever not in use by (a) person(s) whom I consider to have organisational legitimacy.	○	○	○	○	○
I am encouraged turn my PC off whenever not in use by (a) person(s) whom I consider to have a legitimate right to influence my behaviour.	○	○	○	○	○

Comments (Optional)

* 29. Knowledge

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am well-informed about sustainable computing.	○	○	○	○	○
I have a good understanding of how sustainable computing initiatives work.	○	○	○	○	○

Comments (Optional)

* 30. When did you start turning your computer off when not in use?

- ○ Less Than a Year Ago
- ○ 1-2 Years Ago.
- ○ 3-5 Years Ago.
- ○ 6-10 Years Ago.
- ○ More Than 10 Years Ago.
- ○ I Have Not Started Yet, But I Intend to Start In a Year's Time.
- ○ I Have Not Started Yet, But I Intend to Start In 2-3 Years Time.
- ○ I Have Not Started Yet, But I Intend to Start In 4-5 Years Time.
- ○ I Have Not Started Yet and I Have No Intention to Do So.
- ○ Other (please specify)

* 31. Personal Behaviour

- ○ I am venturesome and eager to be the first to try pro-environmental initiatives.
- ○ I adopt pro-environmental initiatives and influence others to do so.
- ○ I am willing to follow the lead of others in adopting pro-environmental initiatives.
- ○ I need to be convinced of the benefits of a pro-environmental initiative before I adopt it.
- ○ I am usually suspicious of new initiatives and I prefer to maintain the status quo.

32. Do you wish to know the results of this survey?

- ◯ No
- ◯ Yes (Please Enter Your Email Address)

Appendix 9: Diffusion of Sustainability Mindset Questionnaire

As an informed participant of this research study, I understand that:

1. My participation is voluntary and I may cease to take part in this research study at any time and without giving a reason.
2. All data will be stored anonymously once it has been collected. This means that it will be impossible to trace information back to me. As such, if I decide I want to withdraw my data from this study, I will be able to do so within 4 weeks from the date of participation. If I decide to withdraw my data, I should contact Mr Khaled Hader directly at: k.hader@derby.ac.uk.
3. All information appearing in the final report will be anonymous. This means there will be nothing that will enable people to work out what I said.
4. This research has been approved by the University of Derby's Ethics Committee. This means it has been approved by a panel of professionals to make sure it meets high standards.
5. All my questions about the study have been satisfactorily answered and I am aware of what my participation involves.
6. Mr Khaled Hader will treat my participation in this study confidentially and anything I say in the survey is considered extremely confidential.

1. I Have Read and Understood the Above, and Agree to Take Part:

Name (Optional)

Date

* 2. Age

- 16-19
- 20-25
- 26-30
- 31-36
- 37-44
- 45-50
- 51-59
- 60 or above.

* 3. Gender

- Male
- Female
- Other (please specify)

* 4. Education

- ◯ Secondary
- ◯ Diploma
- ◯ Bachelor Degree
- ◯ Masters Degree
- ◯ PhD
- ◯ Professorship

* 5. Work Experience

- ◯ Less than 1 year
- ◯ 1-2 years
- ◯ 3-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ Over 20 years

* 6. Position

- ◯ Senior Management
- ◯ Middle Management
- ◯ Line Management
- ◯ Employee

* 7. Do you apply "sustainable thinking" to your workplace activities (e.g. avoid printing whenever is possible)?

- ◯ Yes (If YES, please go to Question 8)
- ◯ No (If NO, please go to Question 9)
- ◯ Other (please specify)

8. Do you intend to continue applying "sustainable thinking" to your day-to-day activities at work?

- ◯ Yes (Go to Question 10)
- ◯ No (Go to Question 10)
- ◯ Maybe
- ◯ Other (please specify)

9. Do you intend to embrace "sustainable thinking" in the future?

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Other (please specify)

* 10. Attitude

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Applying "sustainable thinking" at work is important.	◯	◯	◯	◯	◯	◯	◯
Sustainability should be made a priority.	◯	◯	◯	◯	◯	◯	◯

Comments (Optional)

* 11. Subjective Norm

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
Most people whom are important to me think I should embrace "sustainable thinking".	◯	◯	◯	◯	◯	◯	◯
Most people whose opinion I value won't approve of me behaving unsustainably.	◯	◯	◯	◯	◯	◯	◯

Comments (Optional)

* 12. Perceived Behavioural Control

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
I find it easy to behave sustainably at work.	○	○	○	○	○	○	○
I am confident that if I wanted, I could lead a sustainable lifestyle.	○	○	○	○	○	○	○

Comments (Optional)

* 13. Intention

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
I intend to apply "sustainable thinking" to my work whenever is possible	○	○	○	○	○	○	○
My intention to behave sustainably at work is strong.	○	○	○	○	○	○	○

Comments (Optional)

* 14. Behaviour

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
I have already embedded "sustainable thinking" into my workplace behaviour.	○	○	○	○	○	○	○
I routinely and regularly try to find more sustainable ways of working.	○	○	○	○	○	○	○

Comments (Optional)

* 15. Confirmation

	Strongly Disagree	Mostly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Mostly Agree	Strongly Agree
For me, sustainable thinking has become a habit.	○	○	○	○	○	○	○
Sustainability is deeply embedded in my workplace culture.	○	○	○	○	○	○	○

Comments (Optional)

* 16. Perceived Relative Advantage

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
"Sustainable thinking" helps to create a more positive working environment.	○	○	○	○	○
The benefits of sustainable work practices outweigh the efforts of their adoption.	○	○	○	○	○

Comments (Optional)

* 17. Perceived Complexity

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Applying "sustainable thinking" at work is difficult.	○	○	○	○	○
Behaving sustainably requires too much mental effort.	○	○	○	○	○

Comments (Optional)

* 18. Trialability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Sustainable work practices can be trialled.	○	○	○	○	○
I have trialled "sustainable thinking" at work before.	○	○	○	○	○

Comments (Optional)

* 19. Perceived Compatibility

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
"Sustainable thinking" is compatible with my working habits.	○	○	○	○	○
Sustainability is consistent with my personal values & interests.	○	○	○	○	○

Comments (Optional)

* 20. Observability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The benefits of sustainability are evidently observable.	○	○	○	○	○
I have observed my colleagues enjoying participating in sustainability initiatives before.	○	○	○	○	○

Comments (Optional)

* 21. Communicability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I can easily communicate to others why sustainability is important.	○	○	○	○	○
I would have no difficulty telling others about the benefits of sustainability.	○	○	○	○	○

Comments (Optional)

* 22. Perceived Risk

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Sustainability could hinder rather than improve my work performance.	○	○	○	○	○
Sustainability could complicate rather than simplify working practices.	○	○	○	○	○

Comments (Optional)

* 23. Perceived Source Credibility

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I consider the source from which I heard about sustainability to be an expert.	○	○	○	○	○
I consider the source from which I heard about sustainability to be trustworthy.	○	○	○	○	○

Comments (Optional)

* 24. Perceived Argument Quality

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The pro-sustainability arguments are strongly convincing.	○	○	○	○	○
The pro-sustainability arguments are relevant and applicable to my workplace.	○	○	○	○	○

Comments (Optional)

* 25. Perceived Self Interest

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Behaving sustainably gives me a feeling of moral righteousness.	○	○	○	○	○
"Sustainable thinking" boosts my professional image.	○	○	○	○	○

Comments (Optional)

* 26. Perceived Consequences

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Behaving unsustainably distorts my professional image.	○	○	○	○	○
My colleagues would judge me if I behave unsustainably.	○	○	○	○	○

Comments (Optional)

* 27. Perceived Urgency

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Sustainability is of pressing importance.	○	○	○	○	○
Sustainability is needed now, not eventually, not when it fits easily into a schedule.	○	○	○	○	○

Comments (Optional)

* 28. Perceived Persuader Legitimacy

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am encouraged to embrace "sustainable thinking" by (a) person(s) whom I consider to have organisational legitimacy.	○	○	○	○	○
I am encouraged to embrace "sustainable thinking" by (a) person(s) whom I consider to have a legitimate right to influence my behaviour.	○	○	○	○	○

Comments (Optional)

* 29. Knowledge

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am well-informed about sustainability.	○	○	○	○	○
I have a good understanding of how to apply "sustainable thinking" at work.	○	○	○	○	○

Comments (Optional)

* 30. When did you start applying "sustainable thinking" at work?

- ◯ Less Than a Year Ago
- ◯ 1-2 Years Ago.
- ◯ 3-5 Years Ago.
- ◯ 6-10 Years Ago.
- ◯ More Than 10 Years Ago.
- ◯ I Have Not Started Yet, But I Intend to Start In a Year's Time.
- ◯ I Have Not Started Yet, But I Intend to Start In 2-3 Years Time.
- ◯ I Have Not Started Yet, But I Intend to Start In 4-5 Years Time.
- ◯ I Have Not Started Yet and I Have No Intention to Do So.
- ◯ Other (please specify)

* 31. Personal Behaviour

- ◯ I am venturesome and eager to be the first to try new sustainability initiatives.
- ◯ I often adopt new sustainability initiatives and influence others to do so.
- ◯ I am willing to follow the lead of others in adopting sustainability initiatives.
- ◯ I need to be convinced of the benefits of a sustainability initiative before I adopt it.
- ◯ I am usually suspicious of new initiatives and I prefer to maintain the status quo.

32. Email Address

(Confidential! Only Used for Response Identification)

33. Do you wish to know the results of this survey?

- ◯ Yes
- ◯ No

Appendix 10: Ethical Approval - Application and Confirmation

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Request for ethical approval for research undertaken by staff, post-graduate research and post-graduate professional students

Please submit your completed form to the chair of your college research ethics committee (CREC)

Your Name	Khaled Hader
College	College of Business
College Research Ethics Committee	
Staff ID	STF1690
Student ID	100133878
Unimail address	K.hader@derby.ac.uk
Programme name / code	PhD - Centre for Supply Chain Improvement
Name of supervisor(s)	Dr Jose Arturo Garza-Reyes

Title of proposed research study

Influencing Attitudes, Changing Behaviours and Embedding a Sustainability Mindset in Workplace - An Innovation Diffusion Approach

Background information

Has this research been funded by an external organisation (e.g. a research council or public sector body) or internally (such as the RLTF fund)? If yes, please provide details.	No.
Have you submitted previous requests for ethical approval to the Committee that relate to this research project? If yes please provide details.	No.
Are other research partners involved in the proposed research? If yes please provide details.	No.

Signatures

The information supplied is, to the best of my knowledge and belief, accurate. I clearly understand my obligations and the rights of the participants. I agree to act at all times in accordance with University of Derby Policy and Code of Practice on Research Ethics: http://www.derby.ac.uk/research/uod/ethics/

Signature of applicant	
Date of submission by applicant	
Signature of supervisor (if applicable)	
Date of signature by supervisor (if applicable)	

For Committee Use Reference Number *(Subject area initials/year/ID number)* ……..

Date received …… Date considered ……

Committee decision …… Signed ……

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Updated August 2015

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1. What is the aim of your study? What are the objectives for your study?

The aim of this research study is:

- To Develop a Sustainability Diffusion Framework (SDF) That Takes Into Account the Complexity and Path Dependency Nature of Sustainability Diffusion - One That Provides Organisations With Structural Guidelines on How To Successfully Diffuse Sustainability Initiatives.

In order to realise this aim, the following objectives must be successfully achieved:

1. To Investigate, and Argue for, the Applicability of Rogers' (1962) Innovation Diffusion Theory (IDT) to Sustainability.
2. To Identify the Behavioural Factors That, Directly or Indirectly, Influence the Rate by Which Sustainability Initiatives (e.g. Duplex Printing & Sustainable Computing) Are Diffused
3. To Develop a Conceptual Sustainability Diffusion Framework That Incorporates the Factors Identified in Objective No. 2.
4. To Empirically Test the Research Hypotheses Put Forth in Objective No. 3.
5. To Validate the Proposed Sustainability Diffusion Framework (SDF).

In line with these objectives, this research study will answer the following research questions:

1. Can Rogers' (1962) Innovation Diffusion Theory (IDT) Be Applied to Sustainability? If Yes, How Can IDT Be Used To Successfully Diffuse Sustainability Initiatives in Organisations?
2. What Are the Behavioural Factors That Have a Direct or Indirect Influence the Success and the Rate by Which Sustainability Initiatives Are Diffused?
3. Can the Factors Identified in RQ No. 2 Be Incorporated Into Rogers' (1962) Innovation Diffusion Theory (IDT) to Produce a Conceptual Sustainability Diffusion Framework?
4. Can Ajzen's (1991) Theory of Planned Behaviour Be Incorporated Into Rogers' (1962) Innovation-Decision Process Model to Create a More Holistic Sustainability Diffusion Framework?
5. What's the Empirical and Practical Validity of the Proposed Sustainability Diffusion Framework?

2. Explain the rationale for this study (refer to relevant research literature in your response).

Today, the adoption and implementation of sustainability initiatives has become a moral obligation. Sustainability is no longer an option. It is a strategic necessity for organisations to be able to thrive and retain their legitimacy. However, getting employees to adopt a particular initiative is often very difficult even when it has obvious advantages. The adoption process requires a lengthy period of time, often months if not years. Unfortunately, there is still a wide gap between theory and practice. Despite the recent developments in the area of sustainability implementation, there is still little guidance in the literature on how sustainability can be successfully operationalised at the organisational level. It remains unclear how managers should deal with the numerous behavioural challenges during the adoption and implementation processes.

Although the sustainability literature widely discusses the operational factors that affect the success of sustainability initiatives (e.g. Pagell and Wu, 2009: Svensson, 2007; Seuring et al., 2008), there has been little emphasis on the behavioural factors that may contribute to the success or failure of sustainability implementation processes. Various organisational research studies investigated the importance of organisational cultures and their contribution to the success of new sustainability initiatives (e.g. Morsing

and Oswald, 2009; Gitsham, 2012). Other studies investigated the role of managers and the importance of management training in supporting the adoption and implementation of new sustainability initiatives (e.g. Rasmus and Steger, 2000; Andersson and Bateman, 2000; Lacy et al., 2012). All the organisational management studies that had been reviewed fall short from signifying the role of employees' attitudes and behaviours that make up organisations' cultures. It is arguably wrong to assume that organisational cultures will, by default, support the diffusion of new management innovations such as sustainability. Some cultures may promote structural flexibility and encourage innovative behaviours, while others reinforce the status quo. Therefore, organisations must not assume that workers will automatically accept, understand and follow the new rules and guidelines set forth by management during the implementation of new sustainability initiatives (Waddock and McIntosh, 2009). Instead, they should ensure that their workers are fully aware of the need, usefulness and benefits of the new initiatives. Lack of awareness can lead to several organisational implications such as resistance to change, disengagement and job dissatisfaction (Simoes and Esposito, 2014). Haugh and Talwar (2010, p. 384) stated that "many employees may be unaware of sustainability issues beyond their immediate work responsibilities". Lack of awareness and knowledge often leads to numerous behavioural challenges that have the potential to undermine the diffusion, adoption and implementation of sustainability initiatives (Cramer, 2005; Gladwin et al., 1996).

Although several sustainability implementation frameworks had been proposed, researchers have not yet proposed theories or frameworks to help organisations speed up the rate of sustainability adoption and narrow the gap between what is known and what is put into use. Unfortunately, the existing theories have little to offer on how employees' behaviours and attitudes towards sustainability can be better managed to increase the rate of its adoption and enhance the success probability of its implementation. One of the least understood areas of sustainability implementation is non-adoption. Getting sustainability initiatives adopted by individuals is very difficult even when they have obvious advantages. Sustainability, like many other innovations, requires a significant change in individuals' attitudes and behaviours. The extent to which an organisation is able to create a favourable attitude towards a particular sustainability initiative determines the success or failure of their implementation efforts. Unfortunately, the question of how organisations can favourably influence the attitudes of their workers towards sustainability remains unanswered. Our research attempts to fill this gap by proposing an integrated and multi-disciplinary sustainability diffusion framework. It borrows theories and concepts from the innovation diffusion literature and behaviour management literature and applies them to sustainability. It conceptually argues that sustainability has the features and characteristics of an Organisational Innovation, therefore, its diffusion should occur in a similar manner to the diffusion of innovations. It incorporates Ajzen's Theory of Planned Behaviour into Rogers' (2003) Innovation-Decision Process Model to create a diffusion framework that encompasses most of the factors that may, directly or indirectly, influence the rate by which sustainability initiatives are diffused and adopted.

Rogers' (1962) Diffusion of Innovation Theory and Ajzen's (1991) Theory of Planned Behaviour help researchers to identify the factors that influence one's belief, attitude and intention to adopt a particular innovation or embrace a particular behaviour. Hence, the two theories were used as a theoretical foundation to identify 16 different factors that may, directly or indirectly, influence the rate of sustainability adoption, some of which had been either neglected or ignored by other researchers. These factors were then onto a single model to create a "sustainability diffusion framework". The framework takes into account the complexity and path dependency nature of sustainability diffusion. The proposed framework constitutes an extension of both, Rogers' Innovation-Decision Process Model and Ajzen's Theory of Planned Behaviour.

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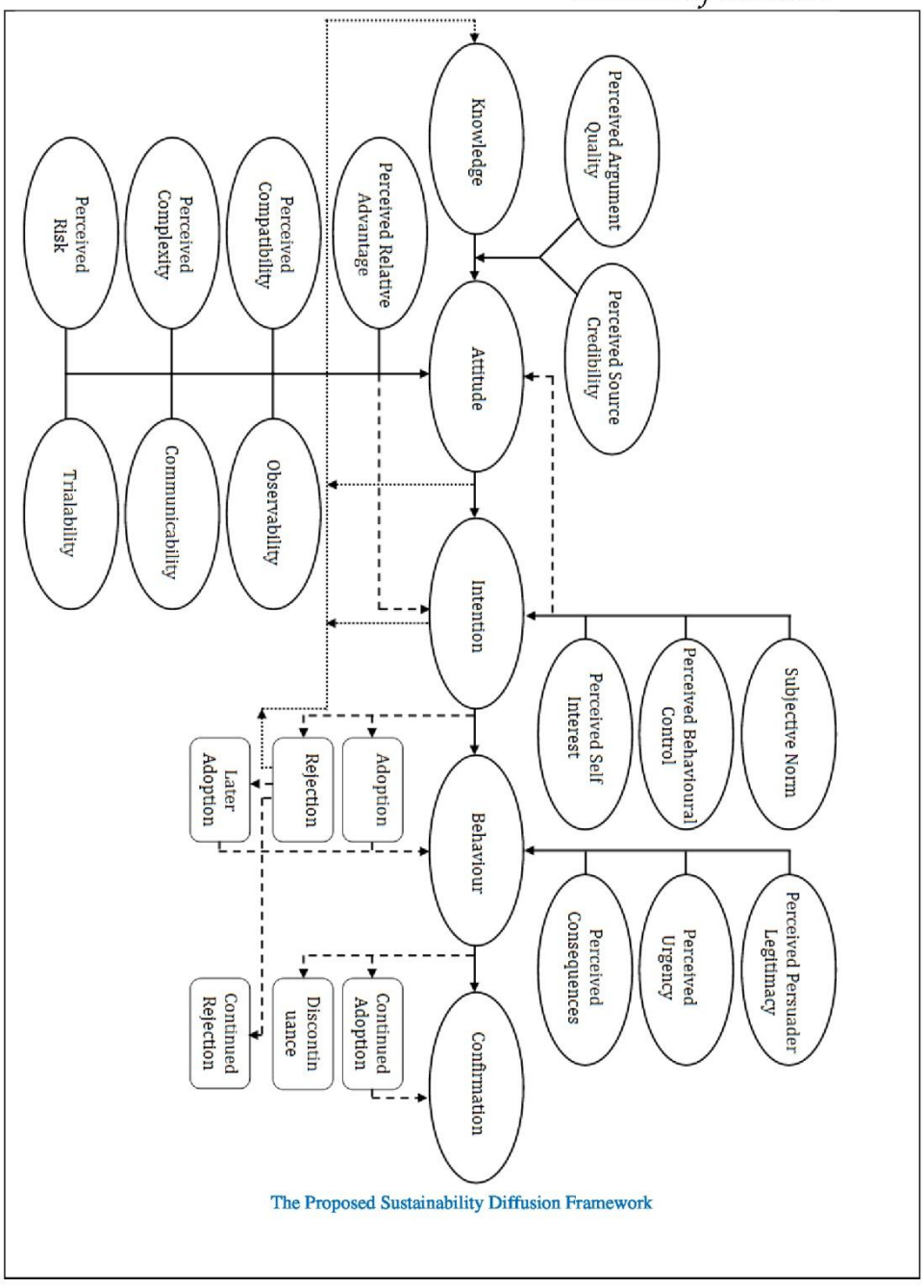

The Proposed Sustainability Diffusion Framework

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3. Provide an outline of your study design and methods.

Cross-Sectional Design

Research design is the framework which guides the collection and analysis of data for conducting a study, including experimental design, cross-sectional design, longitudinal design, case study design and comparative design (Bryman, 2004). Our study adopts a cross-sectional research design. The main difference between cross-sectional design on the one hand and experimental and longitudinal designs on the other hand, is a time dimension. Cross-sectional design implies collecting data at one point in time, in contrast to experimental and longitudinal designs in which data are collected at different points in time (de Vaus, 2001). According to de Vaus (2001; p. 50), cross-sectional design relies on existing variations in the independent variable(s) in the sample; at least one independent variable with at least two categories is present; data is collected at one point of time; and there is no random allocation of groups".

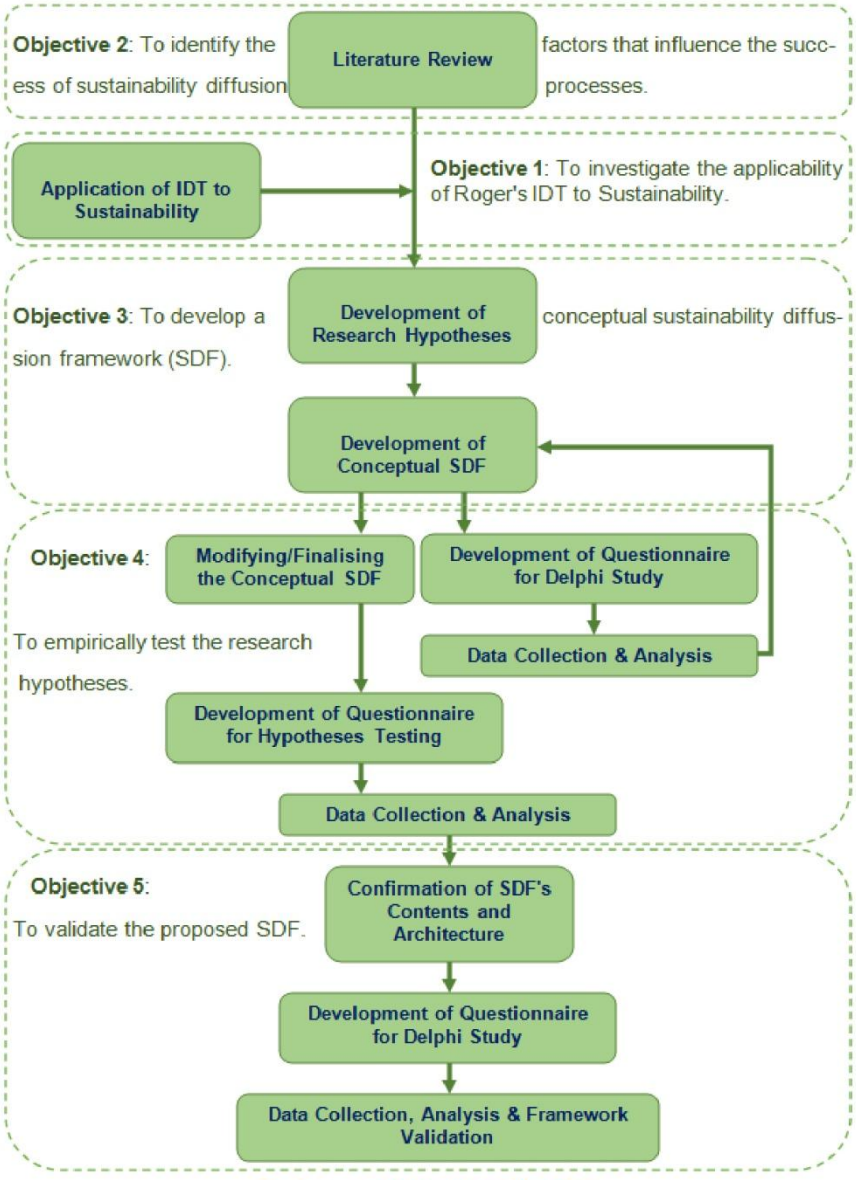
The cross-sectional design was adopted for several reasons. Firstly, cross-sectional design is one of the most widely used approaches in social research and it allows for the handling of larger data sets. Secondly, it is relatively quick, since data are collected at a single point of time and there is no need for repeated collection. Thirdly, it represents cost effectiveness compared with other research designs, such as longitudinal or experimental.

Methods of Data Collection

Collecting primary data can be achieved using two main approaches; first, through communication with people by asking them questions using questionnaires and/or interviews and secondly by observing events, conditions, processes or people's behaviour (Cooper and Schindler, 2001). Our study has adopted the communication approach to data collection. There are several reasons that underline our choice of data collection approach. Firstly, data is needed concerning employees' attitudes and perceptions of sustainability initiatives. According to Churchill and Lacobucci (2002; p. 267) point out that "a respondent's demographic characteristics and lifestyle, the individual's attitudes and opinions, awareness and knowledge, intentions, the motivation underlying the individual's actions, and even the person's behavior may all be ascertained by the communication method". Secondly, the communication approach provides researchers with a greater control over the activities of data collection (Churchill and Lacobucci, 2002). Thirdly, the communication approach provides an effective way of collecting a great deal of data which enhances generalisability when dealing with large numbers of respondents (Abrahamson, 1983).

Our research uses online questionnaires as a data collection instrument. Questionnaires are commonly used for collecting data in a social research context as most people are familiar with questionnaire forms and respond to them confidentially (Abrahamson, 1983). Questionnaires had been used in much previous research work that investigates the diffusion and adoption of innovations (e. g., Agarwal and Prasad, 2000; Chau and Tam, 2000; Damanpour and Gopalakrishnan, 2001). There will be different questionnaires that investigate the same hypotheses and constructs, but different initiatives. The first questionnaire investigates the diffusion of Sustainability as a concept, whilst the second and third questionnaires investigate the diffusion of Duplex Printing and Sustainable computing respectively. All of the three questionnaires/surveys will be administered via email.

The flow chart below provides an abstract view of the overall research process from literature review to the final validation of the proposed framework.



The Research Methodology Flow Chart

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4. If appropriate, please provide a detailed description of the study sample, covering selection, sample profile, recruitment and inclusion and exclusion criteria.

Generally, two categories of sampling techniques can be utilised: probability and non-probability samples. In the first category, each element of the population has a known chance or probability of being selected in the sample. The sample types in this category are simple random, systematic, stratified random and multi-stage cluster. In contrast, non-probability samples imply that there is no specific way to estimate the probability of selecting the elements from the population to be included in the sample. In other words, some elements of the population may have a greater chance of being represented in the sample than others. This category includes convenience samples, snowball sampling and quota sampling (Bryman, 2004). Our study adopts a convenience sampling approach in which data is collected from participants (i.e. employees) whose contact details are easily accessible and whom are more likely to respond favourably to the participation invitation. Convenience sampling is commonly used in social research and very frequently used in the field of organisation studies (Bryman, 2004).

The Diffusion of Duplex Printing and the Diffusion of Sustainability questionnaires will be targeted exclusively towards UK educational institutions. This includes colleges and universities in different parts of the country. There are no geographical exclusion criteria. The invitations will be distributed fairly on the institutions to improve the generalisability of the results. On the other hand, the Diffusion of Sustainable Computing questionnaire will be targeted towards all employees regardless of where they work or their geographical location as long as their occupation involves the use of computers.

In terms of the sample size, it differs from one questionnaire to another. For the Diffusion of Duplex Printing questionnaire, we will aim to target at least 2500 employees and receive around 500 responses (If possible). For the Diffusion of Sustainability and Diffusion of Sustainable Computing, we will invite around 2000 for each survey and aim to receive no less than 300 responses for each survey.

5. Are payments or rewards/incentives going to be made to the participants? Yes ☐ No ☒
If so, please give details.

No payments or rewards or incentives will be made to the participants.

6. Please indicate how you intend to address each of the following ethical considerations in your study. If you consider that they do not relate to your study please say so.
Guidance to completing this section of the form is provided at the end of the document.

a. Consent

Participants will be given an information sheet about the study, after reading this they will be asked if they would like to take part in the study and if they do they will be asked to sign a consent form (Although the consent form will be emailed to participants in Word format, it will actually be completed online as part of the online surveys). Consent will be obtained at the beginning of the questionnaire, where participants will mark a tick box option indicating they have read the study information (invitation, information sheet and briefing) and consent to taking part. The information sheets will explain to the participants why they have been invited to participate, what taking part involves, the conditions under which data will be collected, stored, managed and analysed, and how the study findings will be used and disseminated. The participants will also be given a chance to ask questions. The researcher will further stress that consent is entirely voluntary and that there are no consequences of participation/non-participation.

b. Deception

There will be no deception involved in this study.

c. Debriefing

All participants will be briefed about the purpose and expected outcomes of the study. They will also be invited to ask the researcher any questions they have, before, during or after filling in the online questionnaires. Participants will be emailed a debriefing document which will contain contact details of the researchers should they have any further questions. Additionally an information sheet will be provided to participants explaining the theoretical background of the study.

d. Withdrawal from the investigation

The participants will be informed of their right to withdraw from the study before or after completing the online questionnaires. They will be able to withdraw from the study within 4 weeks from completing the online surveys and prior to the responses being anonymised.

e. Confidentiality

All the questionnaires' data will be collected under conditions of anonymity. All data will be anonymised and participants will not be identifiable in the results of the research as no names will be used when reporting individual participant's data. All consent forms with names printed will be stored separately from the research data in a locked filing cabinet.

f. Protection of participants

This is a low risk study using only questionnaires. We do not anticipate any harm from which participants would need protecting. Taking part in the research is not expected to cause distress or harm, and we hope that the nature and content of the questionnaires will be of interest to participants. However, the contact details for the principle researcher (Khaled Hader) are provided should participants have any questions or concerns.

g. Observation research

This is not applicable to our study.

h. Giving advice

This is not applicable to our study.

i. Research undertaken in public places

This is not applicable to our study.

j. Data protection

All the participants' data will be protected in accordance with the University of Derby's Data Protection policies and regulations. Besides, all the collected data will be anonymised and participants will not be identifiable in the results of the research as no names will be used when reporting individual participant's data. All consent forms with names printed will be stored separately from the research data in a locked filing cabinet.

k. Animal Rights

This is not applicable to our study.

l. Environmental protection

No harm will be caused to the environment as a result of undertaking this research study.

Are there other ethical implications that are additional to this list? Yes ☐ No ☒

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7. Have / do you intend to request ethical approval from any other body/organisation? Yes ☐ No☒
If 'Yes' – please give details

8. Do you intend to publish your research? Yes ☒ No ☐.
If 'Yes', what are your publication plans?

We anticipate that at least 4 research papers will result from undertaking this study. We intend to publish our work in one of the following journals:

- Journal of Cleaner Production
- Journal of Environmental Psychology
- Journal of Environmental Management
- Global Environmental Change
- Journal of Communication Management
- Journal of Business Research
- Procedia - Social and Behavioral Sciences

9. Have you secured access and permissions to use any resources that you may require? (e.g. psychometric scales, equipment, software, laboratory space). Yes ☐ No ☒.
If Yes, please provide details.

10. Have the activities associated with this research project been risk-assessed? Yes ☒ No ☐

Details of the Risk Element	**Potential risk rating prior to controls** eg tolerable, moderate, substantial/severe	**Controls in place to reduce likelihood**	**Residual risk rating after controls** eg tolerable, moderate, substantial/severe
Sampling Problems: Participants May Decide to Drop out.	Tolerable	The consent letters will also include a statement that indicates that participants will not be able to withdraw their questionnaires after 4 weeks.	Tolerable
Equipment Failure (i.e. Computer Crash or Faulty Storage Devices).	Tolerable	This risk can be prevented by ensuring all electronic equipment is maintained on a regular basis. The contingency plan includes a quick replacement of the storage units and computer equipment	Tolerable
Data Loss	Tolerable	This problem can be prevented by backing-up the data on a regular basis.	Tolerable
The Ethical Approval Process Takes Too Long.	Tolerable	This problem can be avoided by submitting the ethical approval form in line with Ethics Committee guidelines and deadlines.	Tolerable
The Ethical Application Gets Rejected.	Tolerable	This can be prevented by identifying all the ethical issues associated with this research study and devising plans to reduce any ethical issues or implications.	Tolerable

Which of the following have you appended to this application?

❑ Focus group questions	❑ Psychometric scales
☒ Self-completion questionnaire	❑ Interview questions
❑ Other debriefing material	☒ Covering letter for participants
☒ Information sheet about your research study	☒ Informed consent forms for participants
❑ Location consent form	❑ Other (please describe)

PLEASE SUBMIT THIS APPLICATION WITH ALL APPROPRIATE DOCUMENTATION

Buxton Campus, 1 Devonshire Road
Buxton, Derbyshire, SK17 6RY

T: +44 (0)1332 590500

Khaled Hader
Flat 3, 77 Forest Road West
Nottingham
NG7 4ER

21st March 2016

Dear Khaled Hader

Re: Influencing attitudes, changing behaviours, and embedding a sustainability mind-set in the workplace - an innovation diffusion approach.

This letter is to confirm that your RD7 has received ethical approval for the primary research through the College of Business, Research Ethics Committee.

Yours sincerely

T. J. Heap

Tim Heap
University Principal Tutor
Chair of College of Business, Research Ethics Committee
University of Derby
1 Devonshire Road
Buxton
SK17 6RY
Tel: 01298 330591
Email: t.j.heap@derby.ac.uk

Cover Letter

Dear [Participant Name],

My name is Khaled Hader and I am a PhD candidate, at the University of Derby. I am currently conducting an investigation into the behavioural factors that influence the rate by which sustainability initiatives are diffused and adopted in the workplace. One of these initiatives is Duplex Printing or Double-sided Printing. This investigation is part of a wider research activity co-ordinated by the University's Centre for Supply Chain Improvement. My research is supervised by Dr. Jose Arturo Garza-Reyes and Prof. Ming Lim.

I am writing to invite you to take part in our Diffusion of Duplex Printing survey. The survey is conveniently short. It will take approximately 6 minutes to complete. All the questions are checkbox-based.

Your participation will contribute significantly to helping us gain a better understanding of the behavioural factors that support or hinder the diffusion of sustainability initiatives in the workplace.

In exchange for your valuable time, we will be happy to share with you the results of this investigation. More importantly, your participation will be intellectually rewarding. The survey's questions will encourage you to rethink some of your perception of sustainability as a whole, and of duplex printing in particular. They will also encourage you to question whether the factors under investigation actually do influence the rate by which sustainability initiatives are diffused or do not.

Here is the link to our survey:

www.surveymonkey.co.uk/r/sustainable-printing

The nature of our investigation is strictly scientific. All information provided by the participants is considered confidential and full anonymity is guaranteed.

If you have any questions concerning this survey, or would like to suggest anything to improve our work, please don't hesitate to contact me.

I would like to thank you in advance for your valuable participation.

Yours sincerely,

Khaled Hader
PhD Candidate
Centre for Supply Chain Improvement
Derby Business School
The University of Derby
Kedleston Road Campus
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Tel: +44(0)1332 593281
K.hader@derby.ac.uk

1st Supervisor
Dr Jose Arturo Garza-Reyes
Senior Lecturer in Operations and Supply Chain Management
Centre for Supply Chain Improvement
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2nd Supervisor
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Head of Centre for Supply Chain Improvement
Professor of Supply Chain and Logistics Operations
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The University of Derby
Kedleston Road Campus
Derby, DE22 1GB, UK
Tel: +44 (0)1332 591770
M.Lim@derby.ac.uk

It should be noted that the data collected from the questionnaire are for academic purpose only. The data can only be accessed by my supervisor, Dr Jose Arturo Garza-Reyes and the researcher. The details of the participants will not be disclosed in this study and any other reports or for other purposes. The data collected will be kept confidentially in line with the University of Derby procedures.

Study Briefing

Influencing Attitudes, Changing Behaviours and Embedding a Sustainability Mindset in Workplace - An Innovation Diffusion Approach

Purpose of the Study:

Today, the adoption and implementation of sustainability initiatives has become a moral obligation. However, getting employees to adopt a particular sustainability initiative (e.g. Double-sided Printing) is often very difficult even when it has obvious advantages. Unfortunately, there is still a wide gap between theory and practice. Despite the recent developments in the area of sustainability implementation, there is still little guidance in the literature on how sustainability initiatives can be successfully operationalised at the organisational level. It remains unclear how managers should deal with the numerous behavioural challenges during the adoption and implementation processes. Although several sustainability implementation frameworks had been proposed, researchers have not yet proposed theories or frameworks to help organisations speed up the rate of sustainability adoption and narrow the gap between what is known and what is put into use. Our research attempts to fill this gap by proposing an integrated and multi-disciplinary diffusion framework.

The Theoretical Framework:

Our research borrows theories and concepts from the innovation diffusion literature and behaviour management literature and applies them to sustainability. It conceptually argues that sustainability has the features and characteristics of an Organisational Innovation, therefore, its diffusion should occur in a similar manner to the diffusion of innovations. It incorporates Ajzen's (1991) Theory of Planned Behaviour into Rogers' (2003) Innovation-Decision Process Model to create a diffusion framework that encompasses most of the factors that may, directly or indirectly, influence the rate by which sustainability initiatives are diffused and adopted.

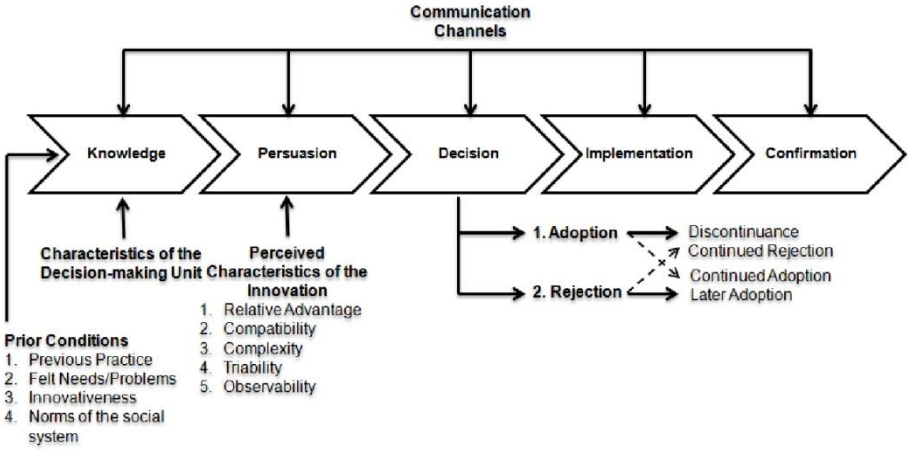

Figure 1: Rogers' (2003) Innovation-Decision Process Model
Adopted from: Rogers (2003, p. 170)

Rogers' (1962) Diffusion of Innovation Theory and Ajzen's (1991) Theory of Planned Behaviour help researchers to identify the factors that influence one's belief, attitude and intention to adopt a particular innovation or embrace a particular behaviour. Hence, the two theories were used as a theoretical foundation to identify 16 different factors that may, directly or indirectly, influence the rate of sustainability adoption, some of which had been either neglected or ignored by other researchers. These factors were then incorporated onto a single model to create a "sustainability diffusion framework". The framework takes into account the complexity and path dependency nature of sustainability diffusion. The proposed framework constitutes an extension of both, Rogers' Innovation-Decision Process Model and Ajzen's Theory of Planned Behaviour.

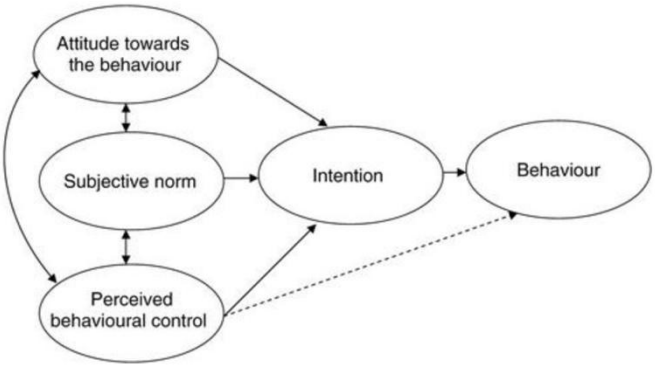

Figure 2: Ajzen's (1991) Theory of Planned Behaviour
Adopted from: Ajzen (1991)

Why Is This Study Important?

This study will help us gain a greater understanding of sustainability diffusion. It draws on the existing behavioural theories in the field of innovation diffusion to help highlight the issues that are considered to be central to sustainability adoption. It identifies the factors that are considered to have a significant impact on the collective adoption process of sustainability initiatives. It also initiates a debate about the applicability of innovation diffusion theories and behavioural control theories to sustainability. More importantly, the results of this investigation will move us closer towards an improved understanding of how workers' attitudes and perceptions of sustainability initiatives can influence the rate of their adoption.

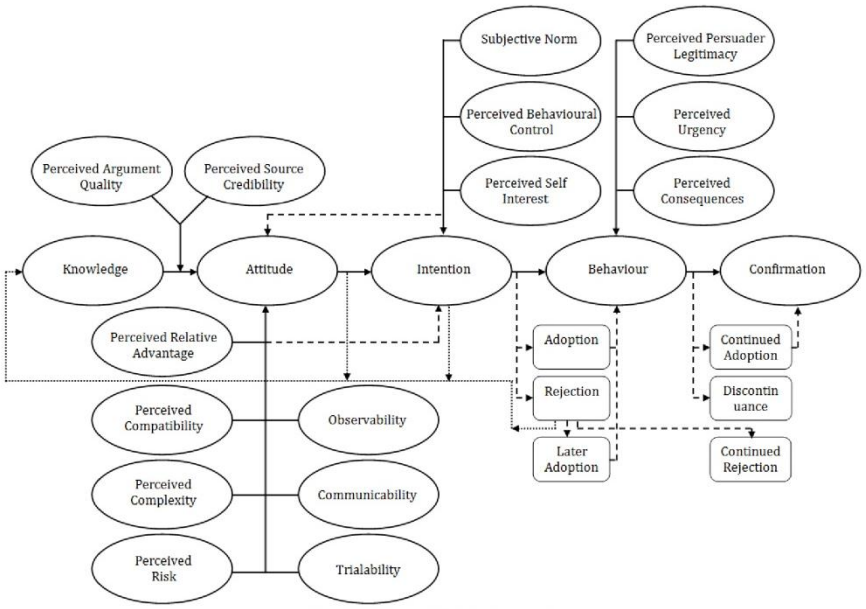

Figure 3: The Proposed Diffusion Framework

What If I Want To Know More?

If you have any questions concerning this study, or would like to suggest anything to improve our work, please don't hesitate to contact me or my supervisor using the following details:

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I would like to thank you in advance for your valuable participation.

Participant Information Sheet & Consent Form

Why do this study?

We are interested in identifying the behavioural factors that influence the rate by which sustainability initiatives such as Duplex Printing is diffused. The working hypothesis of our research is that sustainability is an Organisational Innovation. Hence, we use of Rogers' (1962) Diffusion of Innovation Theory and the Innovation-Decision Process Model in particular as a theoretical foundation. We identified 16 different factors that we believe have an influence on the diffusion rate of sustainability initiatives, namely: knowledge, perceived relative advantage, perceived compatibility, perceived complexity, observability, communicability, trialability, perceived risk, perceived argument quality, perceived persuader legitimacy, subjective norm, perceived behavioural control, perceived self interest, perceived urgency, perceived source credibility, and perceived consequences. Therefore, we need to collect primary data to confirm the relationship between these factors and the rate by which sustainability initiatives (e.g. double-sided printing) is diffused.

What will participation involve?

This research involves filling an online survey. All the questions are check-box-based. You will be asked to indicate whether you agree or disagree with a number of statements related to the 16 behavioural factors on a Likert scale. All information will be stored anonymously, which means no body will know who said what and no one will know that you have taken part in this study.

How long will participation take?

Filling the online survey will take approximately 6 minutes to complete.

As an informed participant of this research study, I understand that:

1. My participation is voluntary and I may cease to take part in this research study at any time and without giving a reason.

2. All data will be stored anonymously once it has been collected. This means that it will be impossible to trace information back to me. As such, if I decide I want to withdraw my data from this study, I will be able to do so within 4 weeks from the date of participation. If I decide to withdraw my data, I should contact Mr Khaled Hader directly at: k.hader@derby.ac.uk.

3. All information appearing in the final report will be anonymous. This means there will be nothing that will enable people to work out what I said.

4. This research has been approved by the University of Derby's Ethics Committee. This means it has been approved by a panel of professionals to make sure it meets high standards.

5. All my questions about the study have been satisfactorily answered and I am aware of what my participation involves.

6. Mr Khaled Hader will treat my participation in this study confidentially and anything I say in the survey is considered extremely confidential.

I have read and understood the above, and agree to take part:

Participant's Signature:_____

Date:_____

Appendix 11: An Example of Pilot Study Results - Duplex Printing

Frequency Tables

The Tables show 52% of the respondents are males, and 48% are females. Most of them are 20-30 years in age (56%) and employees (73%). 41% have a bachelor degree and 31% have a masters degree, while only 4% have a PhD. Concerning the work experience, 65% of them have worked for 3-10 years.

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16-19	11	15.5	15.5	15.5
	20-25	22	31.0	31.0	46.5
	26-30	18	25.4	25.4	71.8
	31-36	13	18.3	18.3	90.1
	37-44	7	9.9	9.9	100.0
	Total	71	100.0	100.0	

Work Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 year	4	5.6	5.6	5.6
	1-2 years	15	21.1	21.1	26.8
	3-5 years	19	26.8	26.8	53.5
	6-10 years	27	38.0	38.0	91.5
	11-15 years	6	8.5	8.5	100.0
	Total	71	100.0	100.0	

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Secondary	1	1.4	1.4	1.4
	Diploma	16	22.5	22.5	23.9
	Bachelor Degree	29	40.8	40.8	64.8
	Masters Degree	22	31.0	31.0	95.8
	PhD	3	4.2	4.2	100.0
	Total	71	100.0	100.0	

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	34	47.9	47.9	47.9
	Male	37	52.1	52.1	100.0
	Total	71	100.0	100.0	

Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Middle Management	1	1.4	1.4	1.4
	Line Management	18	25.4	25.4	26.8
	Employee	52	73.2	73.2	100.0
	Total	71	100.0	100.0	

Frequency Tables for: adoption / rejection; continued adoption / discontinuance; and later adoption / continued rejection were also generated as shown below. The Tables show that 61% of the respondents currently print on both sides of the paper and 95% of them (41 out of 43) will continue to do so. From those who do not print on the both sides, 80% (24 out of 30) intend to do it in the future.

Do you print on both sides of paper?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	28	39.4	39.4	39.4
	Yes	43	60.6	60.6	100.0
	Total	71	100.0	100.0	

Do you intend to continue using double-sided printing whenever is possible?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	2	2.8	4.7	4.7
	Yes	41	57.7	95.3	100.0
	Total	43	60.6	100.0	
Missing	System	28	39.4		
Total		71	100.0		

Do you intend to use double-sided printing in the future?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	6	8.5	20.0	20.0
	Yes	24	33.8	80.0	100.0
	Total	30	42.3	100.0	
Missing	System	41	57.7		
Total		71	100.0		

The pilot test also produced frequency Tables for the rate of diffusion and behavioural innovativeness as presented below. The Tables show that most respondents (28%) have started double-side printing 1-2 years ago. From the point of view of personal behaviour, the majority

of the respondents belong to the late majority group (25%), while 20% of them declare themselves to be innovators.

When did you start using double-sided printing?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less Than a Year Ago	9	12.7	12.7	12.7
	1-2 Years Ago	20	28.2	28.2	40.8
	3-5 Years Ago	13	18.3	18.3	59.2
	I Have Not Started Yet, But I Intend to Start In a Year's Time	13	18.3	18.3	77.5
	I Have Not Started Yet, But I Intend to Start In 2-3 Years Time	9	12.7	12.7	90.1
	I Have Not Started Yet, But I Intend to Start In 4-5 Years Time	5	7.0	7.0	97.2
	I Have Not Started Yet and I Have No Intention to Do So	2	2.8	2.8	100.0
	Total	71	100.0	100.0	

Personal Behaviour

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Innovators	14	19.7	19.7	19.7
	Early Adopters	14	19.7	19.7	39.4
	Early Majority	12	16.9	16.9	56.3
	Late Majority	18	25.4	25.4	81.7
	Laggards	13	18.3	18.3	100.0
	Total	71	100.0	100.0	

Descriptive Statistics

The main statistical indicators (mean, standard deviation, standard error of mean) of the variables of study can be seen in the 'Descriptive Statistics' Table in the next page. The Table shows that the means of the variables range between 3.21 and 5.45; and the standard errors range between 0.123 and 0.307. The results indicate that the variable "Behaviour - Printing on both sides of paper has become a habit" has the greatest standard error of mean.

Descriptive Statistics

	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
Attitude - Printing on both sides of paper is a responsible behaviour.	71	5.23	.162	1.365
Attitude - Printing on both sides of paper is good for the environment.	71	5.45	.165	1.392
Attitude - I think I should print on both sides of paper whenever is possible.	71	5.32	.197	1.663
Subjective Norm - My managers expect me to print on both sides of paper whenever is possible.	71	4.41	.222	1.871
Subjective Norm - Most people whose opinion I value won't approve of me using single-sided printing.	71	4.68	.207	1.747
Subjective Norm - Most people whom are important to me think I should use duplex printing.	71	4.89	.222	1.871
Perceived Behavioural Control - I find it easy to get computers & printers to do what I want them to do.	71	5.45	.148	1.251
Perceived Behavioural Control - I am confident that if I wanted, I could print on both sides of paper all the time.	71	5.14	.191	1.606
Perceived Behavioural Control - It is totally up to me whether to use single-sided or double-sided printing.	71	4.92	.208	1.755
Intention - I will avoid using single-sided printing whenever is possible.	71	5.46	.181	1.529
Intention - My intention to use double-sided printing is strong.	71	5.34	.238	2.007
Behaviour - I routinely and regularly use double-sided printing.	71	4.72	.280	2.361
Behaviour - Printing on both sides of paper has become a habit.	71	4.54	.307	2.590
Perceived Relative Advantage - Printing on both sides of paper is better than using single-sided printing.	71	3.92	.118	.996
Perceived Relative Advantage - It takes the same time to use double-sided printing, but it consumes less paper.	71	3.96	.131	1.101
Perceived Relative Advantage - Double-sided printing saves money, and is better for the environment.	71	3.96	.135	1.139
Perceived Complexity - I find it difficult to get the printer to print on both sides of paper.	71	2.15	.146	1.226
Perceived Complexity - Using double-sided printing requires too much mental effort.	71	2.34	.164	1.383
Trialability - Printing on both sides of paper can be trialled.	71	3.80	.123	1.037
Trialability - I have trialled printing on both sides of paper before.	71	3.31	.152	1.283
Trialability - If I trial double-sided printing and it works for me, I will do it more frequently.	71	3.44	.146	1.227
Perceived Compatibility - Printing on both sides of paper is compatible with my working habits.	71	3.45	.139	1.169
Perceived Compatibility - Printing on both sides of paper is compatible with the nature of my work.	71	3.55	.144	1.216
Perceived Compatibility - Duplex printing is compatible with my moral values and personal beliefs.	71	3.61	.138	1.165
Observability - The benefits of printing on both sides of paper are observable.	71	3.45	.154	1.296
Observability - I have observed my colleagues print on both sides of paper before.	71	3.31	.178	1.498
Observability - The reduction in paper waste as a result of double-sided printing is observable.	71	3.45	.172	1.452
Communicability - I could easily communicate to others why duplex printing is important.	71	4.01	.113	.949
Communicability - I would have no difficulty telling others about the benefits of double-sided printing.	71	3.86	.126	1.060
Perceived Risk - Double-sided printing could make a bad impression of my work's quality.	71	2.46	.153	1.285
Perceived Risk - Duplex printing could negatively affect the readability and presentation of my work.	71	2.54	.166	1.402
Perceived Risk - Duplex printing is more likely to cause paper jam than single-sided printing.	71	2.44	.171	1.442
Perceived Source Credibility - I consider the source from which I heard about duplex printing to be an expert.	71	3.27	.136	1.146
Perceived Source Credibility - I consider the source from which I heard about duplex printing to be trustworthy.	71	3.34	.162	1.362

Perceived Argument Quality - The arguments for double-sided printing are strongly convincing.	71	3.65	.152	1.277
Perceived Argument Quality - The arguments for duplex printing are clear and informative with breadth and depth.	71	3.55	.160	1.350
Perceived Argument Quality - The arguments for duplex printing are relevant to me and applicable to my workplace.	71	3.44	.166	1.401
Perceived Self Interest - Printing on both sides of paper gives me a feeling of moral righteousness.	71	3.73	.139	1.171
Perceived Self Interest - Double-sided printing improves my reputation and/or boosts my professional image.	71	3.56	.147	1.239
Perceived Self Interest - I would take duplex printing much more seriously if it was directly linked to incentives.	71	3.68	.156	1.318
Perceived Consequences - Unsustainable printing hinders my job security and/or chances of promotion.	71	2.89	.155	1.304
Perceived Consequences - Unsustainable printing impacts negatively on my relationship with my superiors.	71	3.21	.151	1.275
Perceived Consequences - Unsustainable printing tarnishes my reputation and/or distorts my professional image.	71	3.34	.162	1.362
Perceived Urgency - Sustainable printing is of pressing importance.	71	3.99	.113	.949
Perceived Urgency - Duplex printing is needed now, not eventually, not when it fits easily into a schedule.	71	3.79	.151	1.275
Perceived Persuader Legitimacy - I was encouraged to use duplex printing by a person whom I consider to have organisational legitimacy.	71	3.24	.180	1.516
Perceived Persuader Legitimacy - I would take duplex printing much more seriously if I were encouraged by a person whom I consider to have a legitimate right to influence my opinion.	71	3.70	.142	1.200
Knowledge - I am well-informed about double-sided printing.	71	3.51	.155	1.308
Knowledge - I have a good understanding of how duplex printing works.	71	3.70	.163	1.377
Valid N (listwise)	71			

Tests of Normality

The results of the Shapiro-Wilk normality tests for the variables of study can be seen in the Table below. None of the variables is normally distributed ($p<0.05$). However, since most statistical tests were pretty robust to violations of normality, it was believed this would not necessarily pose a threat to the future analyses of the actual study.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Attitude - Printing on both sides of paper is a responsible behaviour.	.265	71	.000	.872	71	.000
Attitude - Printing on both sides of paper is good for the environment.	.189	71	.000	.874	71	.000
Attitude - I think I should print on both sides of paper whenever is possible.	.212	71	.000	.848	71	.000
Subjective Norm - My managers expect me to print on both sides of paper whenever is possible.	.244	71	.000	.897	71	.000
Subjective Norm - Most people whose opinion I value won't approve of me using single-sided printing.	.236	71	.000	.891	71	.000
Subjective Norm - Most people whom are important to me think I should use duplex printing.	.200	71	.000	.877	71	.000
Perceived Behavioural Control - I find it easy to get computers & printers to do what I want them to do.	.218	71	.000	.875	71	.000
Perceived Behavioural Control - I am confident that if I wanted, I could print on both sides of paper all the time.	.211	71	.000	.889	71	.000
Perceived Behavioural Control - It is totally up to me whether to use single-sided or double-sided printing.	.238	71	.000	.879	71	.000
Intention - I will avoid using single-sided printing whenever is possible.	.194	71	.000	.862	71	.000
Intention - My intention to use double-sided printing is strong.	.221	71	.000	.784	71	.000
Behaviour - I routinely and regularly use double-sided printing.	.227	71	.000	.806	71	.000
Behaviour - Printing on both sides of paper has become a habit.	.235	71	.000	.755	71	.000
Perceived Relative Advantage - Printing on both sides of paper is better than using single-sided printing.	.308	71	.000	.798	71	.000
Perceived Relative Advantage - It takes the same time to use double-sided printing, but it consumes less paper.	.237	71	.000	.833	71	.000
Perceived Relative Advantage - Double-sided printing saves money, and is better for the environment.	.242	71	.000	.809	71	.000
Perceived Complexity - I find it difficult to get the printer to print on both sides of paper.	.283	71	.000	.795	71	.000
Perceived Complexity - Using double-sided printing requires too much mental effort.	.216	71	.000	.833	71	.000
Trialability - Printing on both sides of paper can be trialled.	.294	71	.000	.846	71	.000
Trialability - I have trialled printing on both sides of paper before.	.226	71	.000	.891	71	.000
Trialability - If I trial double-sided printing and it works for me, I will do it more frequently.	.240	71	.000	.886	71	.000
Perceived Compatibility - Printing on both sides of paper is compatible with my working habits.	.258	71	.000	.883	71	.000
Perceived Compatibility - Printing on both sides of paper is compatible with the nature of my work.	.264	71	.000	.868	71	.000
Perceived Compatibility - Duplex printing is compatible with my moral values and personal beliefs.	.266	71	.000	.868	71	.000
Observability - The benefits of printing on both sides of paper are observable.	.270	71	.000	.859	71	.000
Observability - I have observed my colleagues print on both sides of paper before.	.255	71	.000	.832	71	.000
Observability - The reduction in paper waste as a result of double-sided printing is observable.	.253	71	.000	.826	71	.000
Communicability - I could easily communicate to others why duplex printing is important.	.297	71	.000	.810	71	.000
Communicability - I would have no difficulty telling others about the benefits of double-sided printing.	.257	71	.000	.853	71	.000
Perceived Risk - Double-sided printing could make a bad impression of my work's quality.	.222	71	.000	.820	71	.000
Perceived Risk - Duplex printing could negatively affect the readability and presentation of my work.	.268	71	.000	.842	71	.000
Perceived Risk - Duplex printing is more likely to cause paper jam than single-sided printing.	.253	71	.000	.826	71	.000

Perceived Source Credibility - I consider the source from which I heard about duplex printing to be an expert.	.316	71	.000	.837	71	.000
Perceived Source Credibility - I consider the source from which I heard about duplex printing to be trustworthy.	.278	71	.000	.854	71	.000
Perceived Argument Quality - The arguments for double-sided printing are strongly convincing.	.271	71	.000	.846	71	.000
Perceived Argument Quality - The arguments for duplex printing are clear and informative with breadth and depth.	.222	71	.000	.849	71	.000
Perceived Argument Quality - The arguments for duplex printing are relevant to me and applicable to my workplace.	.248	71	.000	.853	71	.000
Perceived Self Interest - Printing on both sides of paper gives me a feeling of moral righteousness.	.295	71	.000	.836	71	.000
Perceived Self Interest - Double-sided printing improves my reputation and/or boosts my professional image.	.229	71	.000	.878	71	.000
Perceived Self Interest - I would take duplex printing much more seriously if it was directly linked to incentives.	.231	71	.000	.845	71	.000
Perceived Consequences - Unsustainable printing hinders my job security and/or chances of promotion.	.188	71	.000	.902	71	.000
Perceived Consequences - Unsustainable printing impacts negatively on my relationship with my superiors.	.239	71	.000	.889	71	.000
Perceived Consequences - Unsustainable printing tarnishes my reputation and/or distorts my professional image.	.236	71	.000	.872	71	.000
Perceived Urgency - Sustainable printing is of pressing importance.	.281	71	.000	.816	71	.000
Perceived Urgency - Duplex printing is needed now, not eventually, not when it fits easily into a schedule.	.228	71	.000	.830	71	.000
Perceived Persuader Legitimacy - I was encouraged to use duplex printing by a person whom I consider to have organisational legitimacy.	.269	71	.000	.833	71	.000
Perceived Persuader Legitimacy - I would take duplex printing much more seriously if I were encouraged by a person whom I consider to have a legitimate right to influence my opinion.	.259	71	.000	.856	71	.000
Knowledge - I am well-informed about double-sided printing.	.281	71	.000	.849	71	.000
Knowledge - I have a good understanding of how duplex printing works.	.275	71	.000	.810	71	.000

a. Lilliefors Significance Correction

Reliability and Internal Consistency Analysis

The analyses indicate that most construct have a good or very good internal consistency (i.e. Cronbach's alpha greater than 0.70). The "perceived relative advantage" has an acceptable reliability, given that this is an exploratory study, it is not of major concern. However, the construct "perceived persuader legitimacy" poses a problem: it has a weak consistency (i.e. alpha is lower than 0.60). The two items that form this construct seem to be divergent (i.e. they do not seem to measure the same thing). This could have caused potentially unstable solutions in the actual study's results. Hence, the respective statements/measures were modified slightly to improve their reliability and internal consistency. The results of the reliability analyses for the 19 constructs in the questionnaire are presented in the Table below:

Construct	Cronbach's alpha	Internal consistency
Attitude	0.840	Very good
Subjective norm	0.891	Very good
Perceived behavioral control	0.850	Very good
Intention	0.877	Very good
Behavior	0.965	Excellent
Perceived relative advantage	0.679	Acceptable
Perceived complexity	0.815	Very good
Trialability	0.762	Good
Perceived compatibility	0.812	Very good
Observability	0.845	Very good
Communicability	0.799	Good
Perceived risk	0.899	Very good
Perceived source credibility	0.823	Very good
Perceived argument quality	0.887	Very good
Perceived self interest	0.830	Very good
Perceived consequences	0.837	Very good
Perceived urgency	0.748	Good
Perceived persuader legitimacy	0.529	Weak
Knowledge	0.862	Very good

Exploratory Factor Analysis

An exploratory factor analysis was performed to detect the underlying structure of the variables of the study. The program was required to extract the factors that have the eigenvalues greater than 1, using the maximum likelihood method and the Varimax rotation method. The measures of sampling adequacy are presented in the following Table.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.880
Bartlett's Test of Sphericity	Approx. Chi-Square	3843.993
	df	1176
	Sig.	.000

The data presents a good sampling adequacy – the KMO indicator is 0.880 and the Bartlett's test of sphericity is statistically significant: $\chi 2\ (1176) = 3843.993$, $p<0.05$.

Based on the eignevalues, six factors (components) have been extracted. The total variance explained by the components is presented in the Table below. The extracted factors explain 70% of the model variance.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	28.358	57.874	57.874	19.046	38.870	38.870	9.317	19.014	19.014
2	2.525	5.154	63.028	9.864	20.131	59.001	8.250	16.837	35.851
3	1.668	3.404	66.432	2.234	4.559	63.560	6.941	14.166	50.017
4	1.510	3.081	69.513	1.294	2.640	66.200	5.850	11.939	61.956
5	1.271	2.594	72.107	1.244	2.540	68.740	2.107	4.300	66.256
6	1.106	2.256	74.363	.851	1.738	70.478	2.069	4.222	70.478
7	.990	2.021	76.384						
8	.858	1.750	78.134						
9	.854	1.743	79.877						
10	.783	1.597	81.475						
11	.730	1.491	82.965						
12	.640	1.307	84.272						
13	.606	1.236	85.509						
14	.560	1.144	86.652						
15	.505	1.031	87.683						
16	.487	.993	88.677						
17	.469	.957	89.633						
18	.445	.908	90.541						
19	.399	.814	91.356						
20	.368	.751	92.107						
21	.349	.712	92.819						
22	.328	.668	93.488						
23	.303	.617	94.105						
24	.285	.582	94.688						
25	.268	.546	95.234						
26	.240	.489	95.722						
27	.229	.468	96.191						
28	.213	.435	96.626						
29	.191	.391	97.017						
30	.181	.369	97.386						
31	.167	.340	97.726						
32	.146	.297	98.023						
33	.138	.281	98.304						
34	.123	.251	98.555						
35	.108	.219	98.774						
36	.088	.180	98.955						
37	.083	.170	99.124						
38	.073	.150	99.274						
39	.061	.125	99.399						
40	.055	.112	99.510						
41	.050	.102	99.613						
42	.037	.076	99.689						
43	.034	.069	99.757						
44	.031	.064	99.821						
45	.029	.060	99.881						
46	.022	.046	99.927						
47	.016	.033	99.960						
48	.014	.028	99.988						
49	.006	.012	100.000						

Extraction Method: Maximum Likelihood.

Rotated Factor Matrix

The rotated factor matrix is presented in the Table below (only the loadings higher than 0.300 are shown). The factor matrix does not have a simple structure – it presents a lot of important cross-loadings. This indicates a problem related to the discriminant validity of the study's constructs. The loadings suggest that many of factors are not enough unrelated as they should

be and they often overlap. This issue was addressed by making the necessary changes to the wording of the statements responsible for the problematic loadings.

Rotated Factor Matrix[a]

	Factor					
	1	2	3	4	5	6
a1		.380	.691			
a2		.758	.306			
a3	.381	.679				
sn1	.434		.325		.527	.350
sn2	.374	.381			.764	
sn3		.511		.365	.398	
pbc1		.594	.378			
pbc2		.778		.308		
pbc3		.663				
i1	.321	.427	.529			.363
i2	.337	.345	.541			.376
b1	.459		.364	.625		.318
b2	.523			.594		.394
pra1		.315	.521			
pra2	.424					.448
pra3		.575				
pcx1		-.337		-.686		
pcx2	-.391	-.417		-.556		
t1		.462	.413			
t2	.471	.364		.424		
t3		.461	.469	.336		
pc1	.571		.404	.302		
pc2	.568		.383	.473		
pc3		.432	.552			
o1	.614	.473				
o2	.685					
o3	.468	.518		.368		
c1			.741	.390		
c2		.310	.600			
pr1	-.302	-.359		-.545		
pr2	-.480	-.354		-.527		
pr3	-.434	-.334	-.335	-.463		
psc1	.641		.401			
psc2	.680	.335	.323			
paq1	.423	.375	.457	.398		
paq2	.546	.413	.346			
paq3	.738	.379				
psi1	.343	.437	.463			
psi2	.581	.383	.343			
psi3	.384	.403	.378			
pcon1	.742					
pcon2	.653			.379		
pcon3	.538		.333	.315	.336	
pu1		.314	.613			
pu2	.442	.542	.430			
ppl1	.566					.377
ppl2	.305	.508		.390		
k1	.373		.439	.583		
k2	.396	.513	.362	.468		

Extraction Method: Maximum Likelihood.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 11 iterations.