A Service Driven Method for Evaluating Business and IT Alignment

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Declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

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Abstract

The adoption of Information Technology (IT) in organisations has brought significant benefits to business operations. However, achieving business and IT alignment has been and continues to be a major challenge for researchers and practitioners. The rapid changes in business and IT environments and the influence of social aspects on the business value generated by IT have contributed to its increased complexity. In order to be aware of the state of this alignment, organisations are advised to conduct a business and IT alignment assessment. The outcomes of such assessments provide a platform to achieve a better state of business-aligned IT. However, existing methodological approaches to evaluate business and IT alignment at the operational level have lacked the involvement of social values, to be balanced with other tangible values, as factors in the alignment assessment. Addressing this issue is the motivation for this research.

Guided by the Design Science Research (DSR) paradigm, the Business and IT Alignment Assessment Method (B-ITAAM) is developed as the main research contribution. B-ITAAM comprises, in a novel approach, a set of business analysis techniques that assist for a comprehensive business-aligned IT assessment. Principles and concepts from multiple theoretical and methodological perspectives have been adopted to form the theoretical foundations upon which the assessment method is based. As such, concepts from Strategic Management are adopted to establish a link between the strategic and operational levels of an organisation to guide the alignment assessment. Principles from Socio Technical Systems and Organisational Semiotics form the basis for eliciting social values from relevant stakeholders influencing the value of business and IT. Additionally, principles from Service-Oriented Architecture and Enterprise Architecture enable the evaluation method to be service driven. Finally, principles from Task Technology Fit and Social Exchange theories support, respectively, the establishment and assessment of the business and IT alignment.

B-ITAAM was applied in a higher education institution to evaluate its viability as an effective business and IT alignment assessment method. The application resulted in a set of recommendations that aim to enhance the alignment of a set of business and IT services offered by the institution, which received appraisal from nine experts involved in the institution. The application also reveals the complexity of the business and IT alignment assessment in the higher education sector, which, until now, has received little attention in business and IT alignment research.

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List of Publications

Alghamdi, H., Sun, L. 2015. Exploration of the Significance of Cloud Computing in Managing Big Data. *Journal of Emerging Trends in Computing and Information Sciences*, 6, 363-369.

Alghamdi, H., Sun, L. 2016. A Method for Evaluating the Organisation Operational Business and IT Alignment [poster]. *Ninth Saudi Student Conference*, Birmingham, United Kingdom.

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Alghamdi, H., Sun, L. 2017. Analysis of the Fit of Learning and Management Systems in Higher Education Institutions: A Case Study from Saudi Arabia. *International Journal of Business and Economic Affairs*, 2, 260-267.

Full publications are in Appendix I

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Chapter 1
Introduction

This chapter provides a research background and introduces the importance of having well-aligned business and IT at the operational level of organisations, which is the area of focus in this research. The discussion then unveils the motivations behind carrying out this research. Then, the research questions, aim and objectives are presented, which are followed by a presentation of the thesis structure.

1.1 Research Background and Motivation

This research falls within the field of business and IT alignment and focuses mainly on its assessment at the operational level of an organisation. Specific attention in the assessment has been given to social aspects driven from stakeholders involved in the business and IT domains, which are balanced with other tangible technical aspects as important factors for the alignment assessment. This comprehensive assessment aims to provide a clear view of the current state of business and IT alignment at the operational level of an organisation. It also aims to support decisions to be made for enhancing business performance and the business value of IT. The research background and motivations are introduced in the following sections to provide a clear picture of the importance of this research project and the motivations that led to its development.

Research Background

The way in which organisations manage business processes, produce goods, deliver services and communicate with customers has changed dramatically over years due to the significant role that Information Technology (IT) plays in business (Brynjolfsson and Hitt, 2000, Hamidou Dia, 2010, Bharadwaj et al., 2013, Davis, 2017). IT has been recognised by small and large organisations, as well as researchers and practitioners to be a tool that assists in achieving competitive advantage (Liu et al., 2013). It is also considered essential to an organisation's success due to the direct effects it has on mechanisms of creating and capturing value to obtain profits (Drnevich and Croson, 2013), to increase the level of productivity, and to improve the bottom-line performance (Hwang et al., 2011). For these and many other benefits, organisations are investing heavily in IT.

Reports over the last ten years have shown that IT spending in organisations is gradually increasing with little or no sign of decreasing in the near future (Kappelman et al., 2013,

Gartner, 2008, Gartner, 2010, Faheem and Rafique, 2015). Billions of dollars have been invested worldwide in Information and Communication Technologies (ICT) and organisations are still finding it difficult to realise an accurate monetary value on the return from these investments (Liu and Li, 2014). Beynon-Davies (2013) argues that one of the main reasons for this is that business managers tend to focus more on the technology itself rather than on its application. In this context, the most advanced technologies and computer systems become worthless if organisations do not align them effectively to support business needs. Stratopoulos and Dehning (2000) also argue that IT must not exist in an organisation without its effective integration into the organisation's business processes. In other words, a proper alignment of the way that IT supports business strategies and processes is important for an organisation to realise the benefits of its investments in IT resources.

In addition, the large presence of IT in almost every aspect of business puts pressure on organisations to align business and IT strategies with objectives, such as gaining competitive advantage, increasing customer satisfaction, and enhancing operational performance (El Houry and Dogan, 2015). Organisations are also being forced by economic uncertainty to effectively manage the expenditure on IT resources while optimising IT performance (Luftman and Ben-Zvi, 2011). However, in order to have a performance impact, the technology must be aligned with the task it supports (Lu and Yang, 2014). Significant efforts have been made by business and IT leaders, consultants and scientists to achieve this alignment between business and IT since the 1970s (Luftman et al., 1993, Luftman and Brier, 1999). However, obtaining mature business-aligned IT in organisations proves to be difficult, complex, challenging and sometimes chaotic (Plazaola et al., 2006, Coertze and Von Solms, 2014, Rondinelli et al., 2001, Coltman et al., 2015, Schlosser et al., 2015, De Haes and Van Grembergen, 2015). This business and IT alignment issue remains an open challenge for the Information Systems (IS) community (Schlosser et al., 2015).

Several factors have been mentioned in the IT alignment literature which contribute to the increasing complexity of business and IT alignment. They include the rapid changes in business and IT environments (Ullah and Lai, 2013), the lack of top management awareness of IT and its significant role in organisations (Tarafdar and Ragu-Nathan, 2015, Weiss and Anderson, 2004), the isolation in strategic and Information Systems (IS) planning (Tarafdar and Ragu-Nathan, 2015, Luftman et al., 1999), the impact of social perspectives of stakeholders on the business value of IT (Sun et al., 2014), the weak authority of IT departments, and, finally, the political, technical and financial constrains that hinder the implementation and use of advanced technologies (Tarafdar and Ragu-Nathan, 2015).

Effective utilisation of IT resources in an organisation's setting then becomes a concern to business and IT executives when establishing the alignment process between business operations and supporting IT resources. Once established, the evaluation of this alignment is a further concern as its maturity level needs to be continuously monitored and correct decisions for enhancement need to be made once misalignment is detected.

Research Motivation

This research is motivated by two key factors. First, the existing theoretical and methodological challenges in evaluating business and IT alignment at the operational level of organisations, and, second, the researcher's observation of IT challenges that face an IT centre in a higher education institution through the working experience. These factors are discussed in detail below.

First motivation factor

Business and IT alignment is an important research topic (Henderson and Venkatraman, 1993, Queiroz et al., 2012, Karpovsky and Galliers, 2015) that has been critically studied in this research from strategic and operational perspectives to gain a holistic understanding of the nature of this alignment in organisations. Gaps in evaluating this alignment at the operational level of organisations have then been identified based on extant theories and methodologies that are relevant to the analysis of business and IT alignment. The major issues that have been identified from existing research, which motivated this research to be carried out, are discussed as theoretical and methodological challenges in the following list.

First, the focus of existing business and IT alignment research is largely placed on the strategic level of the alignment with less attention given to the operational level (Ullah and Lai, 2013). Consequently, more research is found to discuss the assessment of this alignment at the strategic level to reflect on its value (Tallon and Pinsonneault, 2011, Chen et al., 2008), while also little emphasis is placed on its assessment at the operational level (Silvius et al., 2009). This can be also perceived from the continuous call for functional fit research between business and IT structures, which can be described as the business and IT alignment at the operational level (Maes et al., 2000, Silvius et al., 2009, Wagner and Weitzel, 2006). The importance of the operational level of an organisation arises from its direct impact on the organisation's overall performance, since organisations' strategies and IT activities are all performed at this level (Schlosser et al., 2015).

The assessment of business and IT alignment at the strategic level is only capable to reflect on the state or the performance of planned business and IT strategies at the organisation (Oh

and Pinsonneault, 2007), which is not sufficient to reflect on the operational performance that has a direct impact on customers' needs and satisfaction (Luftman et al., 2009). This research then addresses the assessment of business and IT alignment at the operational level. However, linking the strategic level of an organisation with the operational through strategic concepts is found appropriate for guiding the alignment assessment at the operational level to be focused on critical business and IT activities that are of current and future importance to the organisation. This then leads this research to adopt Key Performance Indicators (KPIs) as a strategic concept to map business goals with critical business operations to guide the alignment assessment at the operational level (Bauer, 2004).

Second, existing approaches to evaluate business and IT alignment at the operational level pay more attention to objective technical and economic factors to determine the value of alignment while dismissing subjective social factors. According to Reich and Benbasat (2000) and Ullah and Lai (2013), the social dimension of the alignment is not sufficiently acknowledged by IT researchers. Therefore, assessing only tangible factors from the economic perspective while dismissing intangible ones limits the determinant factors for the assessment to be only financially driven (Ryan and Harrison, 2000). Social factors, which take into account stakeholders' behaviour and perceptions towards the use of IT, have been recently considered to measure the business value of IT (Jambari, 2014, Liu et al., 2011, Hamidou Dia, 2010). Silvius et al. (2009) point out that there is a need to consider these social aspects and their impact on the value of business and IT alignment. Liu et al. (2011) also argue that although organisations admit the significant impact of cultural and social values in aligning business with IT, there is a scarcity of scientific methods that capture these values in the alignment assessment. This leads this research to take into account stakeholders' perceptions toward business and IT services as an intangible factor that is to be balanced with other tangible ones as determinant factors for the alignment assessment. Thus, principles and concepts from Socio-Technical Systems (STS), Organisational Semiotics (OS) and Stakeholder Theory are adopted to represent and address these social aspects from human actors.

Third, the main challenge in assessing the value of business and IT alignment at the operational level is the dearth of comprehensive practical tools that are capable of simultaneously analysing business and IT from both technical and social perspectives to determine the value of alignment. The recent evaluation method developed by Sun et al. (2014), however, has addressed this issue by considering a number of technical and social aspects as influencing factors on the value of business and IT alignment. However, its heavy

reliance on social aspects to derive the value of business services may not lead to confidence in the overall assessment outcomes, since these outcomes are heavily based on subjective views derived from stakeholders. This research then embraces this comprehensive approach but with more balance among the set of tangible and intangible factors from both business and IT domains as determinant factors to derive the value of business and IT alignment at the operational level. According to Preston (2014), a new approach for defining and evaluating the alignment between business and IT is still needed and the focus should not be placed on internal performance indicators that often lack practicality, but rather on measurable objectives such as customer satisfaction and business value. Besides other technical and financial dimensions, customers' satisfaction with the value of business and IT services is considered in this research as a social dimension that influences the value of business and IT alignment.

The constant changing state of business and IT at the operational level of an organisation (Evans, 2004) represents another major challenge for the development of an alignment assessment tool for assessing unstable business and IT alignment. This research then considers a Service Orientation approach to view and represent business and IT aspects at this level, which provides agility and flexibility that simplify the complex business and IT landscape in the organisation (Khoshnevis et al., 2009). Establishing the alignment of business and IT through the lens of Service-Oriented Architecture (SOA) supports sustainability in the business structure, which subsequently facilitates high-quality services to be provisioned to customers, and profitability to be maintained for the organisation (Zhao et al., 2008). Following this consideration of a service orientated approach to structure and represent business operations and IT resources as services, principles from Task Technology Fit (TTF) are adopted to establish the alignment or fit between these services while taking into account the impact of social perspectives of stakeholders (Goodhue, 2006). To assess the degree of this fit, concepts from Social Exchange Theory (SET) are adopted to integrate quantitative values derived from tangible factors with qualitative values derived from intangible factors to provide a holistic value of the business and IT alignment.

Finally, Higher Education Institutions (HEIs), being either private or public organisations (Nordin and Kasbon, 2013), have received the least business and IT alignment research compared to many other public and private organisations across different sectors. For instance, the banking sector is investigated by Broadbent and Weill (1993) to measure the strategic alignment between business and IT. The health sector is also studied by Yetton and Johnston (2001) who found conflicting priorities and challenging budgetary pressures to be

the major challenging issues that are experienced by many health information systems. In addition, the automobile sector is studied by Ullah and Lai (2011) in an attempt to align business with IT to generate system requirements by modelling business processes. However, the higher education sector has not been given any appropriate attention in the IT alignment research (Ullah and Lai, 2013). Karpovsky and Galliers (2015) review different sectors that were covered by IT alignment cases including manufacturing, banking, healthcare, finance, insurance, wholesale and many others, and found that the education sector has the least attention in the IT alignment literature.

Luftman and Kempaiah (2007) found in their study of 197 organisations that the maturity level of business and IT alignment in the education sector is the lowest compared with many other industry sectors such as health, transportation and insurance. Achieving mature business and IT alignment in this sector is considered a complex task due to its idiosyncratic nature (Pirani and Salaway, 2004). However, this sector performs under enormous pressure to reduce costs and improve outcomes similar to many other industry sectors (Sheets and Crawford, 2012). Being financially efficient and able to improve outcomes can be attained by IT capabilities if they are properly harnessed to do so. This research then sheds some light on business and IT alignment in this sector through the application of the developed business and IT alignment assessment method in a higher education institution, which provides more understanding about alignment complexity in this sector.

Second motivation factor

Whilst working at an IT centre for a higher education institution for nearly two years, the researcher observed continuous complaints from students about provided IT services. This then raised the question of the applicability of existing IT resources to support students' academic and management needs at the institution. It also raised another question of the quality of the business services independently from the IT support. These questions can then be addressed through a business and IT alignment assessment to determine whether IT resources invested in by the institution fit well to support related business services, and whether or not these business services are of sufficient quality to realise the business value of IT. Although this factor has also motivated this research, careful consideration in the development of the alignment assessment method has been given to common business and IT issues across different business sectors.

In view of these motivations, the research problem that this thesis addresses is the lack of an integrated method that facilitates the assessment of business and IT alignment at the

operational level of an organisation, while considering both tangible and intangible factors that influence this level of alignment. The scope of the research is then confined to devise a ***method*** for evaluating business and IT alignment at the ***operational level*** of an organisation from ***tangible and intangible perspectives***. This work will then contribute to the field of business and IT alignment by a service driven approach that comprises a set of business analysis tools, which will guide the business and IT alignment assessment from a strategic level, profile business and IT services, analyse the capability of these services, assess their level of alignment and provide recommendations to enhance these services with respect to improving business performance to better meet customers' needs and increase their level of satisfaction.

1.2 Research Questions

A set of research questions has been defined based on the identified challenges, with these questions guiding efforts towards finding proper solutions and shaping the focus of the research. The research questions are as follows:

1. What are influential factors which affect alignment of business and IT at an operational level in organisations?
2. What is a suitable methodology for facilitating an evaluation of business and IT alignment?
3. What are the recommendations derived from the evaluation process that feed back to business improvements?

1.3 Research Aim and Objectives

This research aims to develop the Business and IT Alignment Assessment Method (B-ITAAM) as a methodological approach for evaluating business and IT alignment at the operational level of an organisation. B-ITAAM comprises a set of business analysis techniques that are not only capable of guiding and facilitating alignment assessment at the operational level, but also capable of providing recommendations by which business performance can be enhanced to better meet customers' needs and expectations. The following objectives are defined to achieve the research aim:

- To understand the issues that are involved in business and IT domains within an organisation.
- To study service driven approaches and define the characteristics of business and IT

elements at the operational level of an organisation.

- To examine theoretical foundations that support the analysis and evaluation of business and IT alignment at an operational level.
- To explore best practices in business and IT alignment assessment and determine the main challenges associated with them.
- To define a set of tangible and intangible factors that influence the value of business and IT alignment at the operational level.
- To establish a research framework to guide the development of the assessment method.
- To develop a service driven method with a set of techniques for facilitating an evaluation of business-aligned IT at the operational level of organisations.
- To design a set of recommendations, as a result of the evaluation for improving business performance.
- To experiment and validate the methodology in a chosen case study based on a selected data source.
- To critically evaluate the research approach and the developed solution in terms of its feasibility, usability and usefulness to identify limitations and propose future work.

1.4 Thesis Structure

The remainder of the thesis is organised as shown in Figure 1.1. A list of abbreviations is presented in (Appendix A) to facilitate quick access to the acronyms used throughout this research.

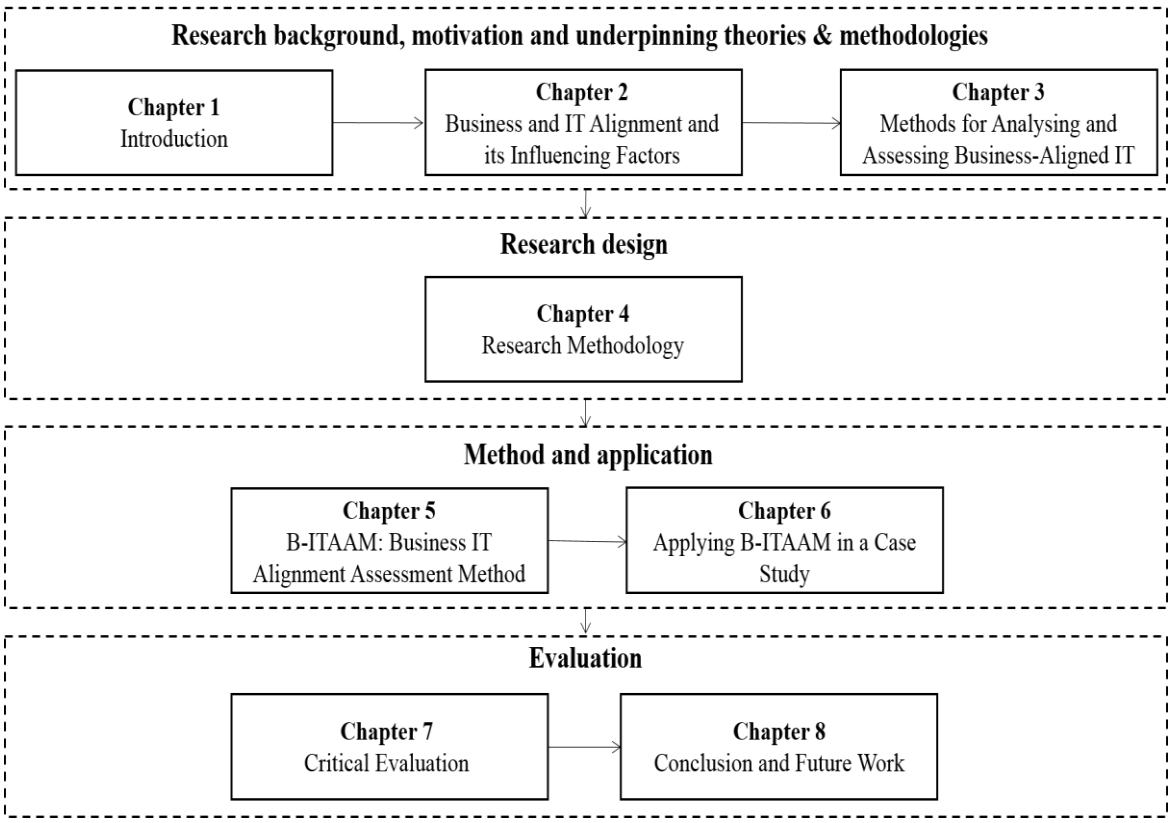

Figure 1.1: The structure of the thesis

Chapter 2 investigates the context of this research through elaborate discussion of the business and IT domains in an organisation setting with particular emphasis on the relationship between these two domains from an alignment point of view. Tangible and intangible factors that are found to affect this alignment at the operational level are then highlighted through discussion of business and IT from a Socio-Technical Systems perspective. Then, principles and methods from Organisational Semiotics theory are introduced to articulate social aspects from stakeholders as influencing factors on the value of business and IT in an organisation. This then leads to the introduction of stakeholder theory to understand different types of stakeholders and their level of varying influences on the value of business and IT alignment in an organisation.

Chapter 3 builds on the discussion of business and IT alignment in Chapter 2 by introducing theoretical and methodological principles that illustrate how this alignment can be theoretically analysed and how it can be methodologically assessed. Based on this, principles from Service-Oriented Architecture (SOA) and Enterprise Architecture (EA) are found suitable to structure and represent business and IT as services, which facilitates the analysis of their alignment. Principles and concepts from Task Technology Fit (TTF) and Social Exchange Theory (SET) are also found suitable for establishing and assessing the alignment

between business and IT while taking social aspects into account. This chapter also introduces multiple theoretical and practical approaches that have considered the role of stakeholders in establishing and assessing alignment between business and IT at the operational level. Following extensive discussion on theoretical and methodological foundations in this chapter, it concludes with a critical evaluation of chosen principles and techniques to underpin the development of the proposed approach for assessing business and IT alignment at the operational level.

Chapter 4 reviews research methodology approaches and techniques that are applicable to information systems research. Among different research paradigms, Design Science Research (DSR) is found suitable for the problem-solving nature of this research. This leads to the adoption of a mixed methodology approach to guide the selection of appropriate data collection and analysis techniques for the case study that is carried out as an inquiry method. Following the principles of DSR, the research activities that are undertaken in this research are defined and introduced in this chapter. The chapter concludes with a description of the data source and the approach to be taken to validate and evaluate the developed method.

Chapter 5 introduces B-ITAAM as a methodological solution to facilitate the evaluation of business and IT alignment at the operational level of an organisation. B-ITAAM defines a set of fourteen business analysis techniques, grouped into four analysis stages to guide a comprehensive practical analysis and assessment of business and IT alignment driven by business goals. B-ITAAM is capable of linking the strategic level of an organisation with the operational level so that the alignment assessment process can focus on critical business and IT services. B-ITAAM is also capable of profiling business and IT services, analysing the capability of these services based on a defined set of factors, integrating the outcomes of the analysis of these factors to generate an alignment value, and providing recommendations by which business performance can be enhanced to better meet customers' needs.

Chapter 6 applies B-ITAAM in a real-world case study, reflecting on the four stages of analysis defined in Chapter 5. This is to experiment the effectiveness of B-ITAAM as a methodological solution to assist for evaluating business and IT alignment at the operational level of an organisation. B-ITAAM is applied in a higher education institution, which is suitable due to its large number of offered academic and management services and also its heavy involvement of variety of stakeholders who can influence its operational performance. The outcomes of the application of B-ITAAM provide facts that are shared with the institution's board of management to enhance operational performance such that it meets students' requirements and increases their satisfaction levels.

Chapter 7 critically evaluates B-ITAAM. Initially, B-ITAAM is evaluated through a case study to determine its viability as an effective business and IT alignment assessment method. In this chapter, however, it is evaluated in terms of its feasibility, usability and usefulness by nine experts from a higher education institution. The chapter then presents a set of contributions that this research has made to the theory and practice of business and IT alignment. It concludes with a discussion of a set of identified research limitations.

Chapter 8 concludes the research by highlighting its main activities and findings. It also provides suggestions for further research to extend and enhance the capability of B-ITAAM.

Chapter 2
Business and IT Alignment and its Influencing Factors

Business and IT are described in this chapter as two important elements of an organisation. The alignment between these two elements is simply described as the relationship between them. Given that an organisation can be divided into strategic and operational levels, the alignment must be represented at both levels in order for the organisation to enhance operational performance, reduce IT costs and improve agility towards changes. However, the rapid changes in business and IT environments and the involvement of multiple technical and social aspects within the business and IT domains create further complexity with regards to achieving this alignment. This chapter describes the landscape of business and IT domains in an organisation and focuses on reviewing the alignment between them at both strategic and operational levels. The relationship between these two domains is also discussed from a Socio-Technical perspective, representing multiple technical and social aspects that have impact on the value of business and IT in organisations.

2.1 The Landscape of Business and IT in Organisations

A modern organisation can be seen as a complex information system that comprises business and IT elements at both strategic and operational levels, while being influenced by its surrounding environment to achieve its objectives (see Figure 2.1). The strategic level represents business and IT strategies to achieve organisational goals, while the realisation of these goals is described at the operational level (hereafter is referred to as "organisational operation"). Both business and IT are influenced by the surrounding environment including stakeholders and new advancements in business and IT environments. For instance, the business paradigm has been influenced by the adoption of service-orientation approach following its application and advancements in the IT domain.

As illustrated in Figure 2.1, the major elements that are involved at each level of an organisation are the business and IT elements, which are driven by the organisation's goals. While business elements describe the organisation's niche in the market, IT elements have been transformed from being only back-office support to being integrated with the business elements in order to add significant value to the organisation (Mitra et al., 2011). Managing and structuring information within these major elements is complex due to the existence of

a variety of information to be articulated. It is even more complicated due to the dynamic environment that shapes the organisation.

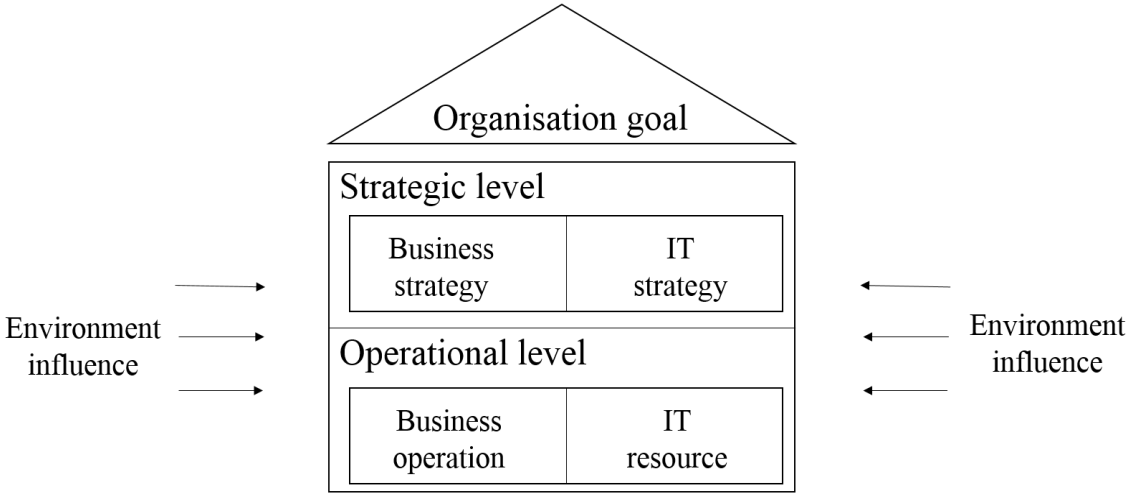

Figure 2.1: An illustration of the business and IT domains in an organisation (adapted from Henderson and Venkatraman, 1993)

Various types of information describing the business elements have contributed to the increased volume of information in the organisation. This information can be classified as explicit or implicit information (Jambari, 2014). Explicit information refers to tangible elements such as the mission, vision, strategies, governance, financial performance, technical quality, etc., which are formally represented and documented. The vision and mission statements of an organisation represent its character uniqueness (Campbell and Tawadey, 2016). According to the leadership theory, the vision statement sets the direction towards a desirable and realistic future state for the organisation (Bennis and Nanus, 1985). In other words, it answers the question "What do we want to become?" (Fred and Forest, 2015), while the mission statement is defined as a timeless statement that answers the questions of "What is our business, and what should it be?" (Campbell and Yeung, 1991).

Successful organisations that have been able to link their business operations to an overarching vision have shown more success in terms of financial performance, growth and visibility (Hogan, 1997). The mission and vision statements are tend to be used synonymously and interchangeably, although both statements are distinct (DuFour and DuFour, 2012). Strategic objectives and Critical Success Factors (CSFs) can then be drawn from the vision and mission statements of an organisation, which are defined in competitive terms and highlight the areas of focus (Campbell and Yeung, 1991, Quesada and Gazo, 2007). Subsequently, strategies and goals can be developed by an organisation to achieve these overarching objectives that are critical to the organisation (Marr, 2010). The difference between strategic objectives and strategies is that the former are large long-term goals while

the latter are small detailed steps for achieving the former.

Implicit information, on the other hand, refers to intangible aspects that are informally represented, such as the perceptions of human actors towards the business offerings in the organisation and working behaviour (Walsh, 2014). The focus on the social perspective of the business has emphasised the importance of articulating the intangible values that have significant impact on business performance (Bei and Chiao, 2006). The effectiveness of the organisation's performance will be supported once various information of a business element is holistically composed from both strategic and operational levels, which highlights the importance of information management within an organisation.

Similarly, information related to an IT element comes in different types which needs to be articulated to describe the capability of an IT element for supporting business needs. The technical aspects of an IT element represent one type of this information. Technical capabilities are required to perform the automation requirements by the business to function properly (Olivier, 2009). These technical aspects of an IT element represent a significant measure for determining the quality of the performance of IT as being enabler to the business operation (Oh and Pinsonneault, 2007). Moreover, the quality of an adopted IT element can be realised through measuring the acceptance and the level of satisfaction of associated users who use IT in the business (Jan and Contreras, 2011). This as another type of information is intangible, which reflects the social dimension that impacts the performance and quality of IT. Integrating tangible technical and intangible social information represents the variety of information that can be elicited to describe IT elements within an organisation.

It is crucial to articulate multiple types of information related to business and IT elements in order to thoroughly address their impacts on the organisational operations. Humanistic factors that include, for instance, emotions and feelings of stakeholders are some examples of information articulated from social aspects, which has significant impact on the formal and informal business activities in the organisation (Reich and Benbasat, 2000). Formal business activities represent the business that has been officially defined and documented in the organisation's business portfolio, while informal business activities refer to business that falls outside the formal business scope but still follows the working norms of the organisation and improves the quality of the formal business (Mullins, 2007).

The value of the operational performance of an organisation is a business-related information that organisations constantly monitor in order to realise whether or not business operations and activities are being performed according to business strategies and goals. Key Performance Indicators (KPIs) are discussed next as a key concept for linking the strategic

level with the operational level so as to measure the operational performance of an organisation and guide the business and IT alignment assessment.

2.1.1 Key Performance Indicators to Measure Operational Performance

Key Performance Indicators (KPIs) are indicators that are driven from the vision, mission and strategies of an organisation to measure operational performance (Wetzstein et al., 2009b). As a strategic management tool, KPIs are suitable for linking the strategic level of an organisation with the operational level in order to provide feedback on operational performance and guide the alignment evaluation process. This is to ensure that efforts spent on measuring the alignment of business and IT elements are focused on areas that have high levels of criticality to the organisation. According to Parmenter (2015, p.7), KPIs "*focus on the aspects of organisational performance that are the most critical for the current and future success of the organisation*". KPIs then act as business operational performance metrics (Sabharwal and Wali, 2013). In this case, KPIs are mapped onto business operations to reflect on how well these operations are being performed in relation to the organisation's objectives. The progress of business and IT alignment and the operational performance of the organisation can then be tracked and accountability can be established (Bauer, 2004).

The wide adoption of a service-oriented approach by the industry requires defined services to be monitored through sets of KPIs (Wetzstein et al., 2012). This is to ensure that these services are being effective and meet certain business goals. According to Wetzstein et al. (2009b), KPIs can be influenced by a number of performance metrics. A metric is a standard of measurement that allows us to measure aspects and behaviours of interest. It is unlikely that a single metric can tell the whole story about operational performance and multiple metrics are usually needed from different perspectives (Mateski et al., 2012). Wetzstein et al. (2009a) explain that performance metrics are on a different level of granularity than KPIs. While a KPI can measure the success of a business service as a whole, a performance metric can only capture a single feature of the service. This is why multiple subjective and objective metrics, encompassing technical and non-technical, should be considered by an organisation as factors that influence and contribute to the violation of KPIs desired values.

Demonstrating various information involved in business and IT domains in an organisation is supported by Socio-Technical Systems (STS) theory, which is underpinned as the theoretical framework to reflect this information.

2.2 Business and IT Perceived from Socio-Technical Viewpoint

An organisation can be described as a ‘‘*complex socio-technical system that comprises interdependent resources of people, information, and technology that must interact with each other and their environment in support of a common mission*’’ (Giachetti, 2016, p.4). Socio-Technical Systems (STS) theory highlights the complexity of the interactions between social and technical aspects in an organisation, which impact on the functionality and usability of technical capabilities to enable the business (Walker et al., 2008). A balanced relationship between social and technical aspects is required to ensure effectiveness in business and IT (Harteloh, 2003). Social aspects that are related to the business, such as knowledge, behaviour and culture values, can support the effectiveness of business and IT in the organisation when properly elicited (Baxter and Sommerville, 2011). Likewise, technical aspects that involve devices, methods and techniques need to be articulated to enhance business performance.

The dual or joint optimisation for describing social and technical aspects related to business and IT is identified as a main principle in STS theory. This principle highlights the importance of having balanced relationships between social and technical aspects in an organisation in order to determine the effectiveness of business and IT (Trist and Bamforth, 1951). A business entity in an organisation is influenced by social aspects from associated stakeholders, as well as technical aspects from defined business processes. Similarly, an IT entity is socially influenced by inevitable human usage and interventions and also technically influenced by specified technical capabilities. The balance seen through the dual optimisation principle is in the influence of the technical aspects towards social aspects and vice versa, in both business and IT entities. Sets of concepts based on the dual optimisation principle are adaptable to describe the social and technical aspects associated with business and IT in an organisation (Cherns, 1976, Clegg, 2000).

These concepts are defined through the view that the performance of business and IT is in its highest state when the interdependency between social and technical aspects is effectively managed (Avgerou and Madon, 2004, Clegg, 2000). The interdependency relationship indicates that social aspects described in the concepts of people and structure, and technical aspects described in the concepts of technology and task, are dependent on each other to justify their importance in the organisation (Bostrom and Heinen, 1977). Arrows in Figure 2.2 illustrate various interdependency relationships between concepts that reflect the relationship between business and IT in an organisation. The complexity in the relationship between business and IT can be clearly represented through the multi-directional interactions

between the concepts.

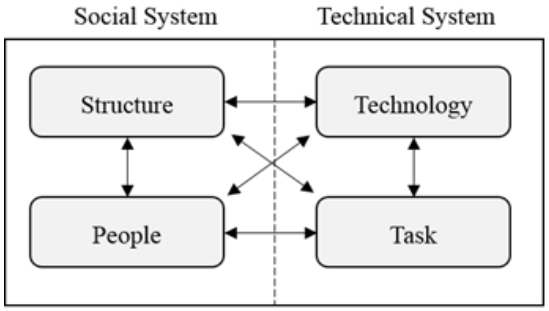

Figure 2.2: Social and technical aspects that impact on the relationship between business and IT (Bostrom and Heinen, 1977)

As an example of this complexity, the socio technical interaction can be established from the technology concept, then applied by people to execute a specific task in order to support the business structure. The variety of interdependency relationships between social and technical concepts needs to be comprehensively defined and composed to form a holistic representation of the business and IT. Clegg (2000) highlights the importance of establishing dependencies between business requirements, relevant stakeholders and IT in the organisation due to the existence of multiple tasks that are assigned to people and technology concepts. Considerable attention in this research is given to people and their perceptions of business and IT performances in the organisation. The perceived value of people involved in the socio-technical system is acknowledged as a valuable requirement for describing business and IT. However, this value can be error-prone and unreliable due to its humanistic nature (Avgerou and Madon, 2004).

The varied information related to business and IT elements within a socio-technical organisation can then be enhanced through the articulation of social aspects from involved stakeholders. However, these intangible social aspects are considered to be unstable in nature due to the constant changes in the business environment that affect stakeholder's behaviour (Johannessen et al., 2001). This information must then be meticulously articulated to ensure its validity. Hence, Organisational Semiotics theory, through its principles and methods, is adopted to facilitate social information articulation.

2.3 The Articulation of Social Aspects through Organisational Semiotics

Social aspects involved within business and IT elements are recognised to provide valuable information that reflects on the influence of these aspects on the value of business and IT in

the organisation. However, complexity appears when articulating these social aspects as part of varied information in the organisation. Social aspects in the organisation can be found in norms that are involved in the organisational operations, which can be explicitly articulated through the principles of Organisational Semiotics (OS). OS as a major area in the information system discipline (Avison and Nandhakumar, 1995); is a field of study that is based on the study of signs (Stamper et al., 2000, Clarke, 2001). It supports the analysis, description and explanation of organisational behaviour and structure. In relation to business and IT effectiveness, identifying business norms based on OS principles is the focus for understanding the social, technical and organisational behaviour (Gazendam, 2004).

Liu (2001) defines norms as patterns of behavioural consistency amongst a group of people with regards to how they should behave in a coordinated way in certain situations based on their socially shared beliefs. To avoid ambiguity in understanding the concept of social norms, Rimal and Lapinski (2015) highlight two other related terms that contribute to this vagueness: laws and traditions. Laws and norms can reinforce each other. However, laws differ from norms in that they are clearly codified proscriptions that assign violations to their corresponding vindictive measures. On the other hand, traditions which are similar to norms in that they are both socially negotiated, are more stable and predictable when compared with norms. Norms therefore are not immutable and they are shaped and understood through communication processes (Rimal and Lapinski, 2015, Acemoglu and Jackson, 2015). Liu and Li (2014) point out that norms act as a force field governing every part of the organisation and also the IT systems in such a way that they:

- Enable people in the organisation to communicate and coordinate through specifying the patterns, structures and procedures of communication within the organisation.
- Govern the behaviour of people inside the organisation.
- Sustain the organisation by providing rules, standards and agreements by which people in the organisation can act accordingly.

2.3.1 An Organisational Operation as a Complex Social System

The focus in adopting the principles defined in OS is directed towards the operational level of an organisation. This facilitates the analysis of communications between business operations and supporting IT resources. Liu (2000) describes the organisational operation as a complex social system that is comprised of technical, formal and informal layers (see Figure 2.3). In order to provide seamless support to the business, it is critical for these layers

to be combined together (Liu and Li, 2014).

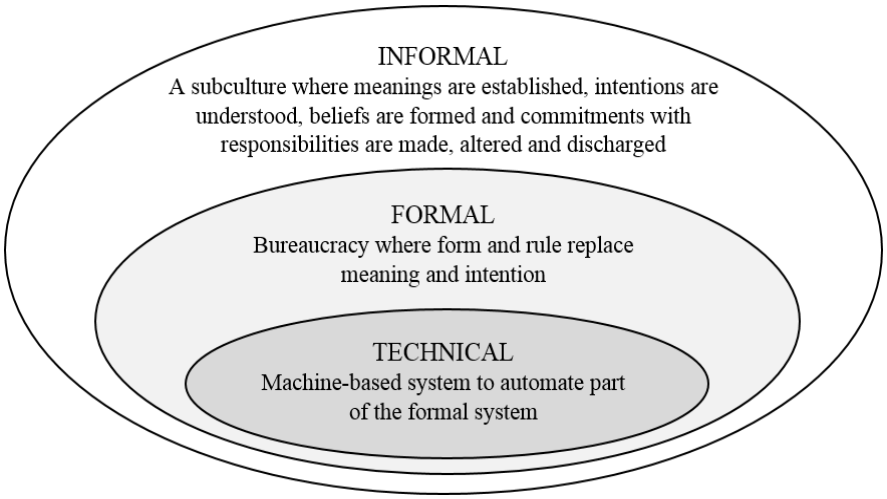

Figure 2.3: The three layers that reflect the norms in an organisational operation (Liu, 2000)

Some of the organisation's operational functions are of high regularity and thus can be articulated as norms defined within these three layers. These functions might be initially executed within the organisation based on practices that have been established from the working culture (Stamper, 1985). In this sense, predominant functions from the practices can be documented as formal rules to govern the execution of functions (Liu and Li, 2014). For those functions that are formalised and experience high repetition, they can then be automated by IT and in this case an IT component will be introduced. That is why an IT component is considered to be part of the formal layer of the organisational operation (Liu, 2000).

On the other hand, the informal layer which envelopes the other two layers indicates that an organisational operation is nothing but an informal system (Liu, 2000). This informal system reflects the complicated social aspects that are then described as formal business rules. The social aspects in the organisational operation, drawn from the behaviour of business and IT, can then be articulated as norms. People within an organisation usually behave according to certain norms that coincide with their personal values, interests, objectives, assigned tasks and organisational goals (Stamper et al., 2000). Liu (2001) points out that it will then be possible for individuals in an organisation to expect and predict the behaviour of others when organisational norms are learned. This would also facilitate collaboration with others for performing coordinated actions. Organisational operations can then be strongly influenced by prescribed behaviour through informal social norms (Fehr and Gächter, 2000). This strong normative influence can assist organisations to analyse business and IT domains to allow better understanding of the currently involved aspects leading to a better future state.

2.3.2 Types of Norms

Norms within an organisational operation boundary are described as the rules that regulate people's behaviour (Bicchieri and Muldoon, 2011). Each department within an organisation may have its own set of norms to govern its activities and IT systems (Liu, 2000). However, norms at a larger organisational scale allow different departments to work in a coordinated manner for common purposes (Liu and Li, 2014). These norms can appear in different forms including official documents, oral communications and also through behaviour. They can then be spread, applied and also followed in assessing an organisational operation.

According to Liu (2000), there are two types of norms that have the capability of coordinating and controlling activities within the working culture of an organisation. Firstly, the formal norms, which are described as business behaviours that are represented in an official or unofficial manner (Bicchieri and Muldoon, 2011). Rules and regulations governing business processes are examples of officially documented norms, whereas verbal agreement on a weekly meeting among staff in one department can be considered as an unofficial norm. The second type is the informal norms, which have indirect impact on the organisation's operational behaviour. They are described as the conventions that people follow based on their cultural background (Bicchieri and Muldoon, 2011). Wearing standard dress at an organisational event is a common informal norm example where this behaviour might not be precisely written in official documents but is still expected. However, such informal norms can be beneficial to an organisation as they provide knowledge about substantial social practices that are related to the formal norms (Stamper et al., 2000).

2.3.3 Norms Classification

Norms can be classified into different perspectives (Stamper et al., 2000). Some of these perspectives are found to be relevant to the context of business and IT in the organisational operation. Norms, for instance, can be classified based on the impact of their execution towards the effectiveness of the organisational operation. In this sense, norms are further classified as *standing orders* that come in the form of commands to perform actions. They then appear in the form that someone 'may', 'may not', 'must', or 'must not' do an action. In an organisation, for example, a department manager can give such orders to business actors to perform certain business actions.

Another relevant classification of norms that is applicable for articulating business and IT is derived from the types of objects that the norms are applied to. Norms based on this classification are further categorised as *substantive norms*, *communication norms* and

control norms. Substantive norms are concerned with core business operation behaviours and they directly influence organisational objectives. Communication norms, however, specify the patterns and procedures of communications within an organisational operation. Finally, the control norms, which introduce sanctions and rewards acting as a mechanism that reinforces the actions to be applied in the organisational operation as they were initially prescribed. Acemoglu and Jackson (2015) state that creating stable self-reinforcing patterns of behaviour in the organisation is possible when stakeholders' interactions are regulated through social norms. The control norms are found appropriate for the aim of establishing the governance in the organisational operation.

2.3.4 Norms Analysis

Norms might not have potential impact on the performance of business and IT in an organisation if they are not properly articulated (Stamper, 1988). Thus, it is crucial to establish the process of analysing norms in the organisational operation and representing them as being part of various information involved within business and IT. More specifically, those norms that are related to governance actions for business and IT operations.

Salter and Liu (2002) provide a norm analysis method that can be utilised to capture the details of norms in the organisational operation. As illustrated in Figure 2.4, the method consists of four steps that have to be carried out in order to explicitly articulate the norms from agents' behaviour. It begins with *Responsibility Analysis* to determine the agents who are responsible for each of the actions. In this step, the focus is placed on determining the type of agent and the actions that are related to the organisational operation. The next step is *Information Identification,* which is performed to specify relevant information towards assigning detailed types of behaviour. Relevant information can facilitate decision-making and act as a checklist that provides accurate information to the responsible agents. The following step is *Triggering the Analysis,* which takes into account the temporal aspects in the actions to specify the timeline for the proper activation of the actions. Finally, the *Norm Specification* step is carried out based on collected information from previous steps to develop a formal specification of the norm as a reference that governs the organisational operation.

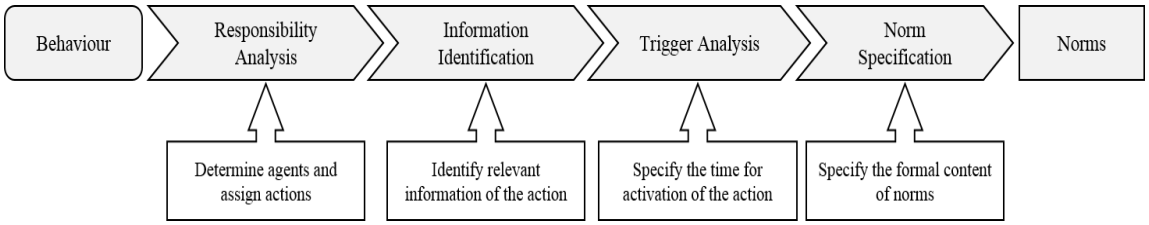

Figure 2.4: Formulating norms in organisations, (adapted from Salter and Liu, 2002)

Norms that are specified from the analysis process are then considered as conditions by which an organisation's behaviour is governed. These conditions are coordinated in a prescriptive means to determine when certain actions are to be performed (Stamper et al., 1997). In addition, adopting a deontic operator in norms articulation helps to specify the norm with respect to the condition that both the object and operation must comply with (Liu, 2000). The shared understanding among stakeholders about actions through a deontic operator can then be defined as being obligatory, permitted, or forbidden (Crawford and Ostrom, 1995). For the purpose of assessing the alignment between business and IT in an organisational operation, articulated norms support the analysis of business processes behaviour as well as the analysis towards proposed recommendations for IT resources. The identification and analysis of norms within an organisational operation assist the articulation of social aspect values and also represent how these values can influence business and IT in the organisation.

2.3.5 Norms Realisation

Norms in the business and IT landscape at the operational level of an organisation can be realised through a set of norm-oriented methods. The set of methods described in MEASUR ((Method of Eliciting, Analysing and Specifying Users' Requirements (Stamper et al., 1997)), support business systems modelling and requirements analysis for IT systems development from a norms point of view (Liu, 2000). The flexibility in customising chosen methods to serve the purpose of the analysis needed is an advantage of adopting MEASUR. Therefore, and for the purpose of articulating the requirements from social perspectives in the organisational operation, Norm Analysis Method (NAM) and the Valuation Framing method are suitable for addressing varied information embedded in the business and IT in the organisation's operational landscape. They then support holistic understanding of different aspects that are involved in the organisational operation.

NAM provides a mechanism by which conditions and constraints in business and IT behaviour can be specified. In the context of the organisational operation, norms specify the

knowledge of the business operation in a form of <*condition*>, and this condition is applied in a <*state*> to the relevant stakeholder(s) <*agent*>, who is affected or being responsible through <*deontic operator*>, to perform the <*action*> required. This norm specification is illustrated in the following form (Liu, 2000).

Whenever <*condition*>
If <*state*>
Then <*agent*>
Is <*deontic operator*>
To <*action*>

Figure 2.5 illustrates an example of a norm construct in the context of establishing business and IT alignment analysis, which is triggered by an IT rationalisation process and supported by a state of poor perceptions of an IT application. Such a norm provides knowledge that assists organisations ensuring effective utilisation of business processes and IT resources that best fit the working culture.

Whenever <*condition*>	*IT rationalisation occurs*
If <*state*>	*The stakeholders' perceived value of an IT application is low*
Then <*agent*>	*Consultant*
Is <*deontic operator*>	*Obliged*
To <*action*>	*Establish business-aligned IT analysis*

Figure 2.5: An example of a business norm

On the other hand, the adoption of the Valuation Framing method is justified by its focus on the social aspects of stakeholders that influence the value of business and IT in the organisation (Liu et al., 2011). Determining the values of business operations and IT resources from a social perspective can then be guided by a set of cultural aspects defined by Hall (1959) (see Figure 2.6). These aspects illustrate how stakeholders may perceive social value towards changes that results from the implementation of IT systems in the organisation. The Valuation Framing will then act as a medium by which stakeholders can express their perceptions towards the value of business services and IT systems guided by social norms.

Social aspects	**Stakeholder A**	**Stakeholder B**	**Stakeholder …**	**Stakeholder N**
Subsistence				
Classification				
Territoriality				
Temporality				
Learning				
Play				
Protection				
Exploitation				
Association				

Interaction				

Figure 2.6: Hall's social norms that guide the assessment of stakeholders' perceptions towards business and IT

The ten cultural aspects are described by Qin et al. (2010) and Sun et al. (2014) as follows:

1) **Subsistence**: business survivability, e.g. the impact of the IT system on job security.
2) **Classification**: differentiation between people by age, sex or qualifications, e.g. whether the system is beneficial to all or certain groups.
3) **Territoriality**: accessibility; availability over space, e.g. whether the system may lead to a loss of control or authority.
4) **Temporality**: availability over time, e.g. issues that affect the system due to interaction and delayed time differences.
5) **Learning**: less abstract for using; easy or difficult to learn, e.g. the level of skills required to learn new functionalities in the system is reduced over time.
6) **Play**: happiness and fulfilment, e.g. whether the job becomes more exciting to do or boring as a result of using the system.
7) **Protection**: rights and fairness; data protection, e.g. access to the system is granted only to authorised people and data confidentiality is maintained.
8) **Exploitation**: appropriate use of material; no conflicts between individuals and an organisation, e.g. an introduction of a new system may lead to a conflict between the organisation and individuals who may need to work for longer hours.
9) **Association**: grouping and alliances, e.g. whether or not the system promotes relationships between stakeholders.
10) **Interaction**: communications and interrelations, e.g. whether or not the system promotes collaboration between stakeholders in the workplace.

The perception of each stakeholder in relation to the social norms listed in Figure 2.6 can then be assessed against business operations and IT systems as gains or losses (Liu et al., 2011). Gains represent the most positive value, whereas losses represent the opposite. Valuation framing is typically applied after stakeholder identification (Qin et al., 2010), which is discussed in more detail in the next section.

2.4 Stakeholders' Influence on Business Operations and IT Resources

In analysing the effectiveness of business operations and IT resources in an organisational operation, it is essential to articulate the social values of involved stakeholders. Stakeholders are defined as individuals or groups who can affect or be affected by the achieved business objectives of an organisation (Freeman, 2010). There is a general agreement among stakeholder theorists such as Jawahar and McLaughlin (2001), Friedman and Miles (2006) and Mitchell et al. (1997) that identifying stakeholders, their relative degree of importance, and ways of managing them are essential to the organisation process. A recent study on stakeholder theory has also pointed out the importance of not only identifying relevant stakeholders and acknowledging their needs, but also on having them involved in the decision-making process (Waligo et al., 2014). The failure to identify relevant stakeholders may lead to neglecting some of the key stakeholders' viewpoints, which could subsequently result in a lack of legitimation and also in other organisational problems (Alexander, 2006, Schwerdtner et al., 2015).

Particular attention in this research has been paid to groups of stakeholders who are involved at the operational level of an organisation due to their ability to provide viewpoints on the performance of business operations and supporting IT resources based on their experiences (Teo and Ang, 2001). The involvement and participation of stakeholders at the operational level reflect their social aspects by which different views on business operations and supporting IT resources can be generated (McLoughlin and Harris, 1997). These various views should be structured and recognised as valuable information that reflects on the social interactions of multiple stakeholders in the organisational operation (Rasmussen, 2000). Enhanced decisions for improving business operations and IT resources at the operational level can then result from analysing these viewpoints as critical inputs from stakeholders. Therefore, it is relevant in this research to discuss stakeholder theory and pay more attention to different categories of stakeholders, specifying their roles as an important source of information that influences business and IT value in an organisation.

2.4.1 Categorisation of Stakeholders

The necessity for identification and categorisation of stakeholders has emerged to enable organisations to focus on their most influential individuals or groups (Paloviita and Luoma-aho, 2010, Preble, 2005). Mitchell et al. (1997) develop a theory of stakeholder classification that offers distinction between different groups of stakeholders. Stakeholders are categorised

accordingly based on three attributes that include *power*, *legitimacy* and *urgency*, as shown in Figure 2.7.

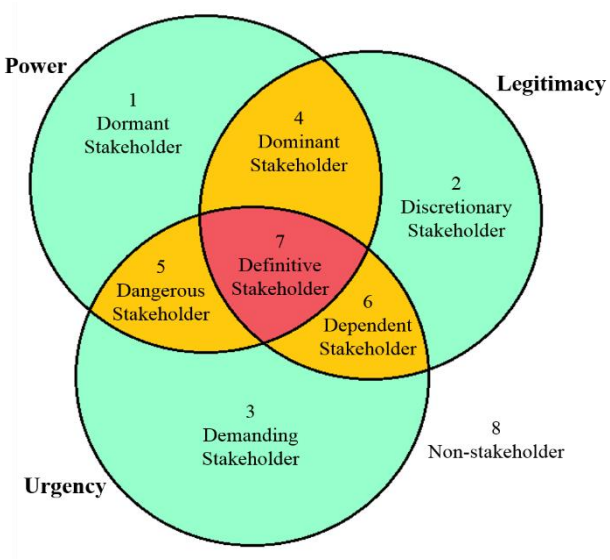

Figure 2.7: Stakeholders' classification and their influence in the organisation (Mitchell et al., 1997) - the original is not coloured

Agle et al. (1999) summarise these attributes in an empirical study as follows. Power refers to the ability of stakeholders to affect the behaviour of the organisation either by having a legitimate claim or not. Legitimacy is described as having a demand on the organisation, based on moral rights, legal or contractual obligations, or by interests caused by the organisation's actions. Finally, urgency is described as the degree to which stakeholders' claims require instant actions.

Seven distinguishable stakeholder categories are specified by Mitchell et al. (1997) based on whether one, two or all three of the attributes are applied in the relationship between the stakeholder and the organisation. Stakeholders with only one attribute are called latent stakeholders and they are represented in green. This group of stakeholders might not be recognised by an organisation and organisations may do nothing about them. Those in orange, with two attributes, are called expectant stakeholders and organisations usually expect something from them and see them as being active rather than passive. The definitive stakeholders in red have all the three attributes and organisations give the highest priority to them (Paloviita and Luoma-aho, 2010).

The categorisation of stakeholders in an organisation illustrates how different stakeholders may differently influence the value of business and IT. For instance, stakeholders who fall into the definitive stakeholders category can have the most influencing power in the organisation. They have the power and the legitimacy, supported by a strong urgency.

Therefore, the level of criticality of such stakeholders in evaluating the relationship between business operations and supporting IT resources is high.

Stakeholders can also be categorised based on their roles in the business and IT domain context. Liu et al. (2006) define a set of roles in a stakeholder identification taxonomy that represents a focal unit or domain that is being influenced by multiple stakeholders' roles (see Figure 2.8).

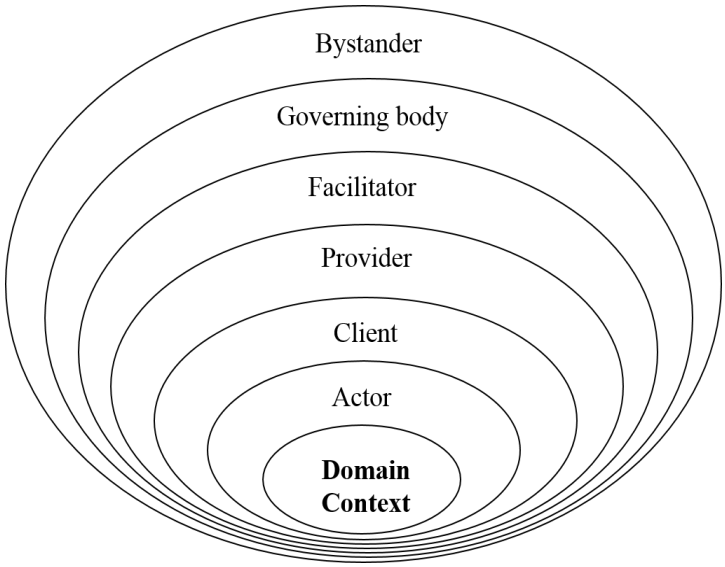

Figure 2.8: Stakeholder identification taxonomy (Liu et al., 2006)

As depicted in Figure 2.8, the closer the role to the domain context, the higher the degree of stakeholder authority or influence on the domain context. The roles are further explained as follows:

Actor: the closest role to the domain context where the stakeholder in this role is directly involved in the delivery of the domain offerings.

Client: the recipient or beneficiary of the outcomes of the domain.

Provider: the role where a stakeholder creates conditions and obligations that affect the outcomes of the domain.

Facilitator: the stakeholder in this role is responsible for ensuring continuity, resolving conflicts and directing the business or IT domains towards achieving organisational goals.

Governing body: stakeholder in this role sets the rules to govern the domain in order to ensure that it is on-track.

Bystander: bystanders have a participative role in shaping both formal and informal

norms. However, they do not have critical interest nor concerns regarding the domain.

Taking into account that an organisation is not performing in isolation from its business ecosystem, another stakeholder identification framework is presented which is developed by Freeman et al. (2007). As shown in Figure 2.9, this framework is formed by taking into consideration individuals and groups who can directly or indirectly affect the organisational operation. Stakeholders are classified in this framework into two main categories: *primary stakeholders,* who are represented in the inner circle, and *secondary stakeholders*, who are represented in the outer one. The former defines most businesses and therefore special attention has to be paid to them by the organisation since failing to do so may severely impact the organisation's survival or performance. The latter consists of a set of groups who can influence the relationship of the organisation with its primary stakeholders.

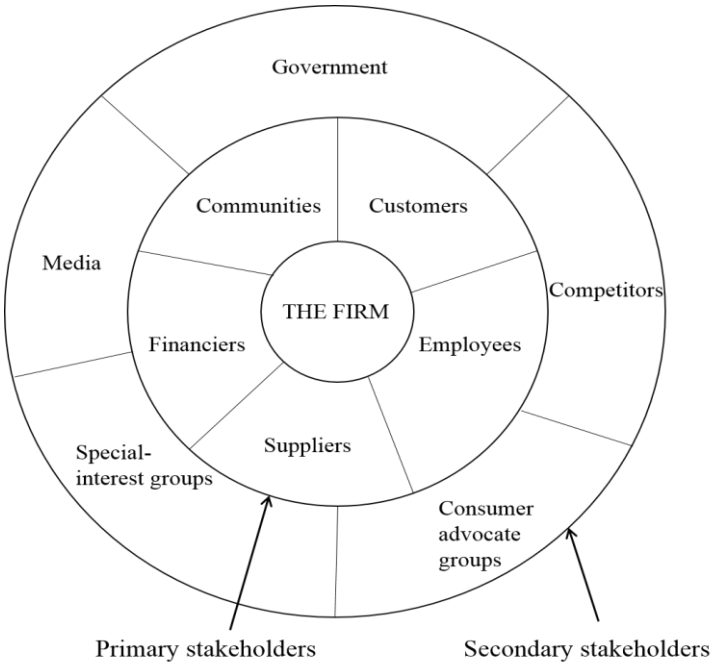

Figure 2.9: Stakeholder framework illustrating primary and secondary groups of stakeholders (Freeman et al., 2007, p. 7)

The discussion of multiple stakeholder categories and roles in this section is aimed at understanding different groups of stakeholders who can influence or be influenced by the performance of business operations and supporting IT resources within an organisational operation. However, since the proposed business and IT alignment assessment method in this research is applied in a higher education institution, stakeholders in this sector are discussed and identified.

2.4.2 Stakeholders in Higher Education Institutions

Higher education is described as education that is achieved after graduation from high school, usually in universities (Hobeanu, 2010). The reliance on information technologies in universities in recent years has increased with more expansion of the role of IT in supporting teaching and learning activities (Price et al., 2007, Richardson, 2005, Deniz, 2014). The rapid technology advancements associated with the internet, social networks and mobile computing have become crucial to boosting and promoting education (Lazinica and Calafate, 2009). This brings the need for universities to heavily invest in new advanced technologies to boost their teaching and learning processes (David and Abreu, 2014). However, these technologies have to be properly aligned with the university stakeholders' needs in order to add value to the academic and management activities that are performed in such institutions.

Mainardes et al. (2010) state that it is important to identify the stakeholders who are involved in higher education institutions to determine their needs and find the means to address and meet them. Several studies have attempted to set out a framework to identify different groups of stakeholders in higher education institutions. Table 2.1 presents sets of individuals and groups of higher education institutions' stakeholders identified during the last three decades.

Table 2.1: A list of higher education institutions' stakeholders identified during the last three decades

Higher education institution stakeholders	Source
Regulatory agencies, suppliers of funding, actors including the media and other public relations professionals to convey the university message whether to employers, students or students' parents.	Smith and Cavusgil (1984)
Students, employees, teaching staff, government, families.	Owlia and Aspinwall (1996)
Government, parents and family, local community, local authorities, students, institutional management team, society, current and future employees.	Rowley (1997)
Students, families, employees and societies.	Franz (1998)
The government, students, employees, professional associations, the academic community and society in general.	Macfarlane and Lomas (1999)
Former students, both graduate and postgraduate students, recruiters, executives, university management bodies, accreditation agencies.	Costin (2001)
Quality agencies, individual academics, students, employees, government, and the country and society in general.	Watty (2003)
Students, academic staff, employees, professional associations, former students.	Blazey et al. (2008)
Other universities, research centres, companies, financial bodies, and incubators.	Nishimura and Okamuro (2008)
Government, students and parents, benefactors and sponsors, collaborators and partners, current and future academic, and employees.	(Hazelkorn (2011), Hazelkorn (2015))

Although these studies have identified a variety of individuals and groups of stakeholders who may benefit from or influence higher education institution performance, other key stakeholders have not been mentioned. There were also no efforts have been made in these studies to distinguish public from clients' stakeholders involved in higher education. These

limitations have been addressed by the work of Burrows (1999) in a comprehensive study that aims to identify and classify all possible stakeholders of higher education institutions. Table 2.2 is adapted from Burrows, showing that stakeholders of higher education institutions are diverse in nature. Different individuals and groups of stakeholders have either high or low levels of influence on the institutions' performances and therefore the degree of their importance varies from one to another. Lam and Pang (2003) point out that boards of management in higher education institutions are responsible for not only identifying who the stakeholders are, but also for determining their needs and recognising their relative importance.

Table 2.2: Higher education institutions' stakeholders (adapted from Burrows, 1999)

Stakeholder category	**Individuals and groups**
Governmental entities and bodies	Government, sponsors, assistant organisers, management boards, and boards of directors.
Clients	Students, students' parents, service partners, employers, social financial bodies, employment agents.
Management	Presidents, vice presidents, directors.
Employers	Academic staff, administrative personnel, support employees.
Contributors/ Donors	Parents, friends, former students, employees, directors, industries, foundations and research boards.
Suppliers	High school institutions, other high educational institutions, former students, food providers, service suppliers, utilities, insurance companies.
Communities	Social services agencies, interested groups, neighbouring, school systems, chambers of commerce.
Competitors	Direct: both public and private higher education institutions. Potential: new alliances, distance higher education institutions. Substitutes: company training programs.
Financial intermediaries	Fund managers, banks, analysts.
Government regulators	The ministry of education, government financing agencies, research panels, support entities, research support bodies, social security, fiscal authorities, and patent offices.
Non-governmental regulators	Accreditations bodies, foundations, religious sponsors, professional associations.
Alliances and partnerships	Co-financiers of teaching and research services, alliances and consortia.

In a case study conducted by Mainardes et al. (2013), they specify students, academic staff and employees to be the main stakeholders of higher education institutions. Among these three groups of stakeholders, Seeman and O'Hara (2006), Jongbloed et al. (2008) and Nicolescu (2009) believe that students are the core stakeholder group in higher education institutions. When students are satisfied with the university's offerings, they may not only recommend the institution to other potential students but may also return for further studies in the future (Alves and Raposo, 2007).

Providing optimal business and IT services to those critical groups of stakeholders in higher education institutions is crucial in order to meet their expectations and also to maintain their level of satisfaction. However, there are multiple tangible and intangible factors that have to be analysed in order to determine how optimal these services are. From an intangible point

of view, the perceptions of those stakeholders – as an important social factor – towards offered business and IT services are analysed in this research from business and IT alignment perspective.

2.5 Business and IT Alignment in an Organisation

Business and IT alignment is the main theme of this research. This section is devoted to providing background information about this alignment and also to describing it at both strategic and operational levels of an organisation. Major issues that face the efforts to achieve mature business and IT alignment at both levels are also highlighted, which provide insights about the aspects that should be considered in the evaluation method that is to be developed to assess business-aligned IT.

2.5.1 Background of Business and IT Alignment

The fields of business and IT are interrelated in the context of business and IT alignment, with IT providing required support at all levels of business to enable effective achievement of goals and objectives (Ullah and Lai, 2013). However, over the last three decades, the issue of business and IT alignment has been a topic of considerable attention in both academic and practitioner literature (Karpovsky and Galliers, 2015). The late 1970s was the first time that the issue of achieving alignment between business and IT was documented (Luftman and Kempaiah, 2007). Since then, it has been continuously observed as a major concern facing business and IT managers (Luftman and Ben-Zvi, 2010, Luftman, 1996).

Just a few years after its first documentation, alignment began to consistently appear in the top 10 IT management concerns between 1980 and 1994 (Luftman and Kempaiah, 2007). This concern has been continuously revealed through a number of surveys carried out by the Society for Information Management (SIM) organisation, which aim to measure the level of importance of multiple IT issues concerning IT managers in organisations. During the last ten years, business and IT alignment was ranked repeatedly as the most concerning issue among several other IT issues (Kappelman et al., 2014). In years where the alignment was not considered as the first concern, it was ranked as the second three times – in 2007, 2009 and 2012 – and was only once in third place, in 2010 (Kappelman et al., 2013, Kappelman et al., 2014). This provides strong evidence that the issue of business and IT alignment remains a noticeable area of concern in the information systems field.

The concept of alignment in both academic and industry sectors has been one of the most frequently studied concepts within the Information Systems discipline (Ullah and Lai, 2013).

However, many organisations are still misaligned (Chen, 2010), fail to take the full advantage of Information Technologies (IT) (Ullah and Lai, 2013), and tend to consider these technologies as back-office support or, in some circumstances, as an expenditure rather than an enabler of business value (Henderson and Venkatraman, 1993, Brynjolfsson, 1993). In order to address this phenomenon, the concept of alignment has been comprehensively studied and discussed by researchers and practitioners under various terminologies throughout the last few decades as shown in Table 2.3. Chan and Reich (2007) point out that subtle differences may exist between different terminologies that aim to describe alignment. However, using multiple terms to address the same alignment phenomenon has contributed to the growing family of IT alignment constructs, leading to more confusion and complexity (Coltman et al., 2015).

Table 2.3: Various terms used to describe the concept of business and IT alignment

Terminology	**Authors**
Balance	(Henderson and Venkatraman, 1993)
Integration	(Broadbent, 1998, Henderson and Venkatraman, 1993)
Fit	(Venkatraman, 1989, Porter, 1996, Chan, 1992, Henderson and Venkatraman, 1993)
Linkage	(Henderson and Venkatraman, 1992)
Fusion	(Smaczny, 2001)
Coordination	(Lederer and Mendelow, 1986)
Harmony	(Luftman, 1996)
Bridge	(Ciborra, 1997)

Some research, such as that of Palmer and Markus (2000), Tallon and Pinsonneault (2011) and Tallon (2003), indicates that there is no relation between business- and IT-aligned organisations and business performance improvement. However, there is a general consensus among researchers and practitioners that business and IT alignment has positive impacts on business performance (Wagner and Weitzel, 2006, Sabherwal and Chan, 2001, Gerow et al., 2014, Oh and Pinsonneault, 2007, Yayla and Hu, 2012, Coltman et al., 2015). These studies that are in favour of the alignment and its influence on enhancing the performance revolve around the concept that organisations will perform well when their IT resources, including physical IT components, technical IT skills, and knowledge assets, are aligned with business strategies and processes.

It is therefore crucial for organisations to have the right IT with the right capabilities fit for the right business requirements if they are to efficiently generate business value from IT. It is more critical than ever before to properly bridge the gaps between business requirements and supporting IT capabilities due to the increased competitiveness of the business environment (Liu and Li, 2014). According to Coltman et al. (2015), maintaining IT alignment in recent years has become more important because misalignment would not only

lead to a decline in performance, but would also lead to difficulties in organisations sustaining market competitiveness and business agility.

2.5.2 Business and IT Alignment at the Strategic Level of Organisations

Strategic alignment between business and IT deals with the capability of IT as not only supporting business strategies, but also shaping and transforming these strategies to unleash new business opportunities (Wagner and Weitzel, 2006). Reich and Benbasat (1996, p.56) define strategic alignment as "*the degree to which the IT mission, objectives, and plans support and are supported by the business mission, objectives, and plans*". This definition, according to Coltman et al. (2015), is considered to be one of the earliest in business and IT alignment research, which forms the foundation for many other alignment studies. Organisations that are able to successfully align their business and IT strategies prove to perform better than their counterparts (Kearns and Lederer, 2003). On the other hand, misalignment between business and IT strategies can prevent organisations from unleashing the power of their technology capabilities to drive their business goals, enhance their efficiency and gain competitive advantages (Liu and Li, 2014).

Earlier strategic alignment studies suggest that IT strategic planning should be based on business strategic planning (Yujie and Xindi, 2010). Haki and Forte (2010), however, draw researchers' attention towards a service-oriented architecture approach for strategic alignment. They suggest that governance should assist business to align with IT, and also provide support in aligning IT investments with organisational goals. In other views of strategic alignment, Sabherwal and Chan (2001) state that reliable organisational performance can be ensured when flexible information systems provide constant support for business strategies. Lederer and Mendelow (1989) suggest that strategic alignment research should revolve around information business and IT strategies because it is hard for IT to understand formal business strategy and, similarly, IT formal strategy is not easy to be understood by the business.

Several antecedents have previously been identified as influencing strategic alignment. For instance, shared domain knowledge between business and IT (Preston and Karahanna, 2009), enterprise architecture maturity (Bradley et al., 2012), governance mechanisms for IT (Wu et al., 2014), and the strategic direction of the organisation (Sabherwal and Chan, 2001). However, in recent years, the heavy investments made by organisations into IT resources and the continuous changes in business strategies have been major influencers of strategic alignment, which require top management to pay more attention to merge the

planning of IT resources at the strategic level (Ullah and Lai, 2013). Luftman and Brier (1999) argue that there will be neither a single combination of activities nor a single strategy that will enable an organisation to achieve and sustain alignment due to the rapid changes in the business and technology climate.

Although the strategic alignment of business and IT has received more attention in the alignment literature than the operational level (Chen, 2008, Ullah and Lai, 2013), it still poses a theoretical and practical challenge for the IS community (Reynolds and Yetton, 2015). However, achieving mature strategic alignment between business and IT would enable an organisation to have its IT to fully support its business strategy, and would also enable it to exploit all available IT resources to be exercised, leading the organisation to have neither IT shortfall nor IT underutilisation (Coltman et al., 2015).

2.5.2.1 Establishing Alignment between Business and IT at the Strategic Level

Several approaches have been proposed to foster the movement towards strategic alignment. These include allowing advanced technologies to provide innovative ideas that will shape the business; evaluating senior executives' performances in regard to their innovative use of IT; embedding IT into a number of departments and business processes; using IT to offer strategic flexibility to the business; and encouraging IT executives to work in partnership with business units (Agarwal and Sambamurthy, 2002). Moreover, the participation of Chief Executive Officer (CEO) in IS/IT planning and the Chief Information Officer (CIO) in business planning are two processes that are associated with key actors and contribute to the organisation's strategic alignment (Kearns and Lederer, 2003). Although insights into means of achieving strategic alignment can be derived from these approaches, Karpovsky and Galliers (2015) argue that such approaches may not be sufficient and a comprehensive, multifaceted conceptualisation of strategic alignment still seems to be lacking.

The enormous advancements in information technologies have changed the role that IT plays in organisations. Due to these advancements, some researchers have argued that IT should have the capacity to challenge and transform the business (Chan and Reich, 2007). This increases the business strategy complexity when the role of IT is changed from being only supportive to becoming vital to business survival. Thus, understanding business strategies and IT strategies is crucial to have a logical understanding of their alignment. Various types of business and IT strategies have been discussed in the literature to address different focuses of the business in the organisation. Prominent business and IT strategies are highlighted to observe the means of their alignment. Miles et al. (1978) and Treacy and Wiersema (1997)

identified viable business strategies which are summarised in Table 2.4.

Table 2.4: Different types of business strategies

Business Strategy	Description	Source
Defenders	Look to maintain a stable business environment by reducing costs, focusing on operational efficiency and effectiveness, while trying to avoid organisational change.	(Miles et al., 1978)
Prospectors	Find and exploit new product and market opportunities to become a leading innovator.	
Analysers	A unique hybrid of defenders and prospectors who closely observe competitors' activities to exploit new product and market opportunities, while at the same time maintain core traditional products and customers.	
Operational excellence	Organisations following this strategy aim to provide products of high quality, low price, easy to purchase.	(Treacy and Wiersema, 1997)
Product leadership	Offer products or services that expand existing performance boundaries.	
Customer intimacy	Focus on delivering what the customers specifically want through deep understating of their requirements and constant development of customer relationships.	

On the other hand, Sabherwal and Chan (2001) and Silvius (2009) have identified two sets of IT strategies that complement business strategies to successfully achieve organisational objectives. The IT strategies, summarised in Table 2.5, provide more understanding of the specifications for establishing strategic business and IT alignment.

Table 2.5: Different types of IT strategies

IT Strategy	Description	Source
IT for efficiency	IT is adapted towards organisational internal efficiencies and enhanced decision-making.	(Sabherwal and Chan, 2001)
IT for flexibility	IT is adapted towards market flexibility, quick decision-making, and short time-to-market.	
IT for comprehensiveness	IT is adapted towards comprehensive decision-making and quick responses, according to knowledge from the market and also from other organisations.	
IT conservative	IT is adapted towards saving costs, improving efficiency, using proven IT only.	(Silvius, 2009)
IT essential	IT is adapted towards improving effectiveness, being essential to realise strategies, using new technologies.	
IT business	IT is adapted towards being the business, using all technologies.	
IT innovative	IT is adapted towards being innovative, achieving competitive advantage, using experimental technologies.	

The alignment between business and IT strategies can then be represented through the mapping of business strategies with IT strategies. The resultant paired business and IT strategies then describe the strategic alignment of an organisation as shown in Table 2.6.

Table 2.6: Mapping business strategies to IT strategies to form a strategic alignment

Business Strategy	IT Strategy	Source
Defender	IT for efficiency	(Sabherwal and Chan, 2001)
Prospectors	IT for flexibility	
Analysers	IT for comprehensiveness	
Operational excellence Product leadership Customer intimacy	Blend of IT: conservative, essential and innovative	(Silvius, 2009)

Three strategic alignment mappings have been described by Sabherwal and Chan (2001) for the IT strategy types to be aligned with Miles et al. (1978) business strategy types. Firstly, IT for efficiency is suggested for an organisation that has planned its business strategy for stability, cost effectiveness, maximum operational efficiency and effectiveness as (Defender). Secondly, IT for flexibility is suggested for an organisation that has planned its business strategy to become a leading innovator (i.e. prospector). Finally, IT for comprehensiveness is suggested for an organisation that has planned its business strategy to be an observer and an exploiter of the market opportunities (i.e. analyser).

Silvius (2009) also defines another set of strategic alignment mappings based on a combination of business strategies with IT strategies. He states that strategic alignment is formed when either of the business strategy types (i.e. operational excellence, product leadership or customer intimacy) defined by Treacy and Wiersema (1997) is combined with more than one type of the IT strategy types (i.e. conservative, essential, and innovation). This combination has to be based on different dominant strengths of IT strategy types in accordance with the business strategy type. The dominant strength is described as the level of suitability of the IT strategy to support the business strategy. For instance, the dominant IT strategy types that are suitable for an organisation that aims for operational excellence are *IT conservative* and *IT essential*. The former focuses on IT for operational efficiency and cost effectiveness, while the latter focuses on the implementation of IT to realise the business strategy.

Achieving operational excellence as a business strategy type defined by Treacy and Wiersema (1997) is found appropriate for the nature of this research as a means of underpinning strategic business and IT alignment. This can be realised through an IT strategy that emphasises the provision of business values based on the refinement and improvement of available IT solutions. This view conforms to the strategic alignment categorisation of Chen et al. (2010), who classify strategic alignment to be either *IS as innovators* or *IS as conservatives*. The former describes strategic business and IT alignment as based on constantly analysing new opportunities and innovations to preserve the organisation's sustainability in the industry. The latter, however, describes strategic alignment as based on enhancing existing business and IT alignment practices to create business value. The focus of 'IS as conservative' is directed towards exploiting existing IT capabilities while simultaneously being aware of the surrounding business environment. It also focuses on evaluating existing IT resources before triggering strategic change. This emphasises the importance of assessing alignment between business and IT beyond the strategic level. A

systematic mechanism is then required for assessing business operations and supporting IT resources towards an effective IT strategic planning. This represents the focus of this research to investigate business and IT alignment at the operational level of organisations so as to support and recommend changes to strategic alignment.

The refinement and enhancement of business and IT alignment at the operational level based on the IS as conservative approach is considered as a top-down approach, where the procedure flows from the top level of the organisational hierarchy to the lower level. Although this approach tends to be explicit and applicable for analysing business operations and IT resources in the organisation (Mom et al., 2007), a bottom-up approach is suggested to provide holistic insights into business and IT alignment within the organisation. This has led this research to exploit strategic concepts and principles for guiding the assessment of business and IT alignment at the operational level, while also conducting a comprehensive bottom-up business and IT alignment analysis that provides feedback towards strategic alignment change.

2.5.3 Business and IT Alignment at the Operational Level of Organisations

Business and IT alignment at the operational level is defined by Silvius (2009, p.1) as "*the degree to which IT applications, infrastructure and organisation enable and support the business strategy and processes*". This alignment is also known as functional alignment, which specifies how IT capabilities can leverage and support business capabilities (Reynolds and Yetton, 2015).

Previous studies have pointed out the importance of having a mature alignment between business processes and supporting IT resources, and the impact that this alignment has on the strategic alignment (Benbya and McKelvey, 2006). While the operations of an organisation can be guided by strategic business and IT alignment to provide a blueprint for the overall organisational activities to achieve desired goals, the realisation of this strategic alignment is reflected at the operational level of alignment. For example, achieving cost effectiveness as a business strategy can be realised through well-aligned business and IT at the operational level where each IT resource supports at least one or more business requirements, leading to non-redundant IT resources.

At the operational level of an organisation, IT capabilities are linked with business operations for automation and also for enhancing the quality of business performance as specified in strategic plans (Ray et al., 2007, Melville et al., 2004). According to Luftman et

al. (2009), the delivery of high-quality products and services that meet or exceed customers' satisfaction is strongly linked with how well business and IT are aligned at the operational level. However, achieving this alignment has been a challenging issue ever since the 1980s and 1990s when awareness increased of the need to develop IT solutions in conjunction with the context in which they should be applied (Henderson and Venkatraman, 1993, Parker and Benson, 1989, Tapscott and Caston, 1993). More recently, organisations have found it complicated to have well-aligned business and IT at the operational level due to rapidly evolving technology innovations and the increasing complexity of business modelling (Wagner and Weitzel, 2012).

In order to be strategically excellent, organisations need to maintain operational efficiency through a coherent relationship between business and IT (Kearns and Lederer, 2000). However, in many circumstances, organisations are being pushed to undertake strategic changes to cope with emerging business needs. These changes of business strategies require business processes at the operational level to be optimised, where the optimisation is tightly linked to IT capabilities that assist automation and ultimately the improvement of the business processes' performance (Cherbakov et al., 2005). This then requires continuous repositioning and enhancements of IT capabilities to cultivate sustainability advantages (Porter and Millar, 1985).

The importance of enhancing and repositioning IT capabilities in an organisational operation represents the need to perform constant assessments of the business value of IT capabilities. This assessment is important due to the fact that organisations often have a significant number of business operations and IT resources that are poorly defined, which results in redundancy among the capabilities of business operations and IT resources (Gammelgård et al., 2007, Sun et al., 2014). In recent years, such assessments for evaluating the business value of IT capabilities have taken into consideration the impact of social aspects towards the business value generated by IT to have a more holistic evaluation approach (Liu et al., 2011, Hamidou Dia, 2010). However, more efforts are still required by researchers and practitioners to address the alignment assessment and many other challenging issues that face business and IT alignment at both strategic and operational levels.

2.5.4 Challenges Facing Efforts to Achieve Business and IT Alignment

The business environment has been going through dramatic changes since the emergence of the business and IT alignment issue (Cherbakov et al., 2005). These changes have brought complex and changing business requirements to organisations, leading them to experience a

state of constant misalignment (Liu and Li, 2014). Similarly, the emergence of advanced technologies has added extra pressure on organisations for change. Silvius (2007) lists some factors that cause such changes in business environments, including the development of new technologies; the introduction of new regulatory changes; the merger and acquisition of companies; and, finally, engagement in entrepreneurial initiatives or strategic alliances. For organisations to succeed in such environments, effective and efficient IT is required to support business strategies and processes (Silvius, 2007). However, it remains a complex task to achieve mature alignment between business and IT due to the rapid changes occurring in both business and IT environments (Ullah and Lai, 2013).

Luftman and Kempaiah (2007) state three reasons that explain why achieving business and IT alignment has been so elusive. The first is that organisations only focus on how the IT side should be aligned with the business side, whereas the alignment must also address how business aligns with IT. The second reason is that organisations have usually looked for answers from individual angles to effectively align business with IT. These angles include right technology, partnership, effective communication between business and IT departments, value measurements, governance and skills. However, all of these angles must be simultaneously addressed to improve a holistic alignment between business and IT. The third reason is the absence of prescriptive and descriptive tools that can not only assist with assessing the maturity level of business IT alignment, but also provide a road map on how this alignment can be improved.

Another challenging issue facing the efforts to achieve business and IT alignment is that this alignment is not a one-off initiative that can be undertaken by an organisation and then it is done with (Chen et al., 2005a). It is, rather, a process that requires continuous adaptation and change (Henderson and Venkatraman, 1993). This justifies why it has remained an open challenge to achieve mature alignment between business and IT (Schlosser et al., 2015). The fact that it is always one of the highest priorities for Chief Information Officers (CIOs) confirms that it is not only challenging to align business with IT, but it is also a target that keeps moving (Coltman et al., 2015).

At the strategic level, business and IT alignment has been defined in a variety of terms and measured in a variety of ways. However, guidelines for specific empirical tests and operational measurements are still not universally available to translate the intensive theoretical literature into reliable measurement tools (Coltman et al., 2015, Luftman and Brier, 1999, Reynolds and Yetton, 2015). One of the major challenges in addressing alignment at this level is the inability to translate the strategic business and IT changes to the

operational level of the organisation. This may mislead the effort of aligning business and IT at the operational level following an obsolete business strategy (Benbya and McKelvey, 2006).

Another challenge in addressing strategic alignment complexity appears from the 'new direction' of the business and IT alignment research. Reynolds and Yetton (2015) argue that previous research on IT alignment implicitly assumes that alignment is a single business strategy to be aligned with an IT strategy at a specific point of time, whereas organisations today have grown to become more digitised and diversified, multi-business firms performing cooperatively and competitively in digital business ecosystems. This means that actions from multiple parties will increasingly be the way for IT to create value and this has been referred to as '*IT-based co-creation of value*' (Kohli and Grover, 2008). Coltman et al. (2015, p.97) point out this new direction of IT alignment research and state that "*The next phase of IT alignment research will need to explicitly account for IT interdependencies associated with coordinating complementary innovators*". In this case, the issue of business and IT alignment is highly likely to be a lot more complex. This is because IT practitioners will be required not only to motivate all participating parties in the co-creation efforts, but also to mitigate any contractual risks that may arise between them (Coltman et al., 2015).

At the operational level, there is generally less research on business and IT alignment than there is at the strategic level (Chen et al., 2008, Tallon and Pinsonneault, 2011, Bergeron et al., 2004). This may have contributed to the absence of a universal robust mechanism that can be used to detect and measure operational misalignment in organisations. Operational misalignment between business and IT occurs when IT resources are not optimally able to support business needs (Chen et al., 2005b). This can lead to have redundant IT resources, which perform the same or similar functionalities, as well as IT obsolescence or low performance of existing IT solutions (Sun et al., 2014). It is a major issue that organisations face at the operational level which contributes to the massive spending on IT resources.

Huge investments in IT resources have been made by organisations in recent years to improve business performance (Gartner, 2010, Faheem and Rafique, 2015, Luftman et al., 2017). However, results have shown that significant impacts on organisational performance can only be realised through IT investments once IT capabilities and business requirements are aligned (Lee and Mithas, 2014). It becomes challenging for organisations, due to the changing business and technology climate, to always ensure the adoption of the most applicable technical capabilities for supporting business needs while also being financially effective (Tallon et al., 2000, Zajac et al., 2000). However, an ideal approach to tackle this

issue would be to focus on the delivery of best-value services that meet business objectives and customers' requirements, while also achieving a successful balance of IT investment with profitable returns (Luftman and Ben-Zvi, 2011).

Obtaining this ideal state in the organisation can also be achieved through continuous assessment of the effectiveness of IT resources in supporting business operations. Benbya and McKelvey (2006) point out that continuous re-evaluation of the assignment of IT capabilities to the right business services must be conducted on a regular basis to prevent organisational operations from slipping into a state of misalignment. However, the absence of reliable comprehensive mechanisms to carry out this assessment has been a major challenge for evaluating the alignment between existing business operations and supporting IT resources (Doumi et al., 2013, Leimeister et al., 2012).

The regular assessment would then provide valuable information about the current capabilities that an organisation has (Wagner and Weitzel, 2012). This will subsequently allow for improving the future state of the organisational operation by addressing the gaps that are identified through the assessment. In order to realise this situation, a holistic business and IT alignment assessment is required. However, there are still some obstacles that challenge the realisation of a holistic alignment assessment approach. The main obstacle is the ability to determine essential requirements for the assessment (Cumps et al., 2009). This refers to the identification and management of the right requirements to be used in the assessment. This obstacle can be further clarified as follows.

- First, the constant changes in the business environment affect the description of business operations and IT resources and therefore influence the assessment of their alignment (Horn, 2005).
- Second, the abundance of tangible and intangible factors as criteria for determining the right requirements (Johannessen et al., 2001).
- Finally, the varied sources of requirements from different stakeholders who are assigned different roles in the organisation (Mitchell et al., 1997, Wong et al., 2012).

It is crucial to formulate the requirements in order to establish a clear understanding of the organisation. When the requirements are well gathered and represented, this enables valuable outcomes to be accrued from the analysis of the current state of alignment between business and IT at the operational level.

The conventional thought of business operations as business processes is another obstacle towards holistic alignment analysis at the operational level, which is inappropriate due to the

recent shift made in business thinking towards service orientation (Bieberstein et al., 2005). Similarly, the description of IT resources as IT services is found appropriate to optimise the value of IT (Schilling, 2000). The nature of the alignment between business operations and IT resources will then be changed when they are described as business and IT services. This will influence the analysis of the alignment to be assessed from a service driven approach that addresses a profitable fit between business and IT services. The outcomes from the assessment can then be used to enhance the operational business and IT landscape.

Finally, business operations in an organisation are influenced by the involvement of social and psychological aspects that shape the informal practices of stakeholders (Chan, 2002). These practices have a strong influence on business sustainability and therefore can be analysed towards evaluating the success or failure of business and IT alignment in an organisation (Brown and Duguid, 2001). However, most previous studies that consider the influential impact of social aspects on IT systems have focused on small-scale environments due to the complexity of addressing contradictory demands from various stakeholders (Baxter and Sommerville, 2011). In this context, the investigation of the impact of these social aspects on business and IT alignment in a large-scale environment is expected to be more challenging. Nevertheless, it is crucial to examine these impacts on an organisational scale to determine the influence of stakeholders towards operational activities in business and IT alignment.

Obtaining a holistic alignment is continuously required in order to realise an optimal alignment state at both strategic and operational levels of an organisation (Joshi et al., 2003). Achieving this holistic alignment at the operational level can be realised when both tangible and intangible factors related to the business and IT domains are elicited and evaluated (Sun et al., 2014). When a mature business and IT alignment state is in place, potential benefits such as business agility, improvement towards changes, more operational efficiency and reduction in IT costs can be realised (Wagner and Weitzel, 2006).

2.6 Summary

This chapter provides the foundations for this research that seeks to develop a business-aligned IT evaluation method. In this, business and IT are clearly described as two interconnected elements that exist in modern organisations. Various implicit and explicit information describing these two elements is highlighted, which reflects on the complexity of structuring and managing business and IT. The discussion of these two elements from a Socio-Technical perspective, in this chapter, reveals a set of social and technical factors that

affect the relationship between business and IT at the operational level of an organisation, providing preliminary answers to the first research question.

The strong influence of social aspects driven from stakeholders on the value of business and IT is emphasised in this chapter. This is because these aspects are believed to influence the level of alignment between business and IT as indicated in the recent studies of Liu et al. (2011), Sun et al. (2014) and Jambari (2014), which all have stressed the importance of articulating stakeholders' behaviour and perceptions in order to effectively evaluate business and IT alignment. This then leads this chapter to discuss Stakeholder theory and Organisational Semiotics' principles and methods to facilitate the articulation of these social aspects. Both social and technical aspects are then considered in the proposed evaluation method to holistically assess the level of alignment between business and IT.

Business and IT alignment as the main theme of this research is then extensively discussed in this chapter. Background information about this alignment is presented, revealing its significance as a major issue that is worthy of further research. The alignment at both strategic and operational levels is also discussed, which highlights the importance of having well-aligned business and IT at both levels to enhance business performance and increase agility towards business change. Along with the discussion of business and IT alignment, challenging issues that confront the efforts towards achieving mature business and IT alignment are discussed, which provide insights into the significance of establishing a clear business and IT alignment relationship.

The learning and concepts that emerged from this chapter emphasis that both technical and social factors related to business and IT should be identified and measured in order to determine a holistic value of business and IT alignment at the operational level of an organisation. The next chapter discusses a set of theoretical and methodological foundations that assist for the development of the new proposed method for evaluating business-aligned IT in organisations.

Chapter 3
Methods for Analysing and Assessing Business-Aligned IT

Theoretical and methodological principles for establishing and evaluating business and IT alignment at the operational level of an organisation are thoroughly discussed in this chapter. They have been derived from multiple theoretical and methodological backgrounds including business and IT alignment theory, Service-Oriented Architecture (SOA), Enterprise Architecture (EA), Task Technology Fit (TTF) theory, and Social Exchange Theory (SET). The aim is to clearly establish business and IT representation, as well as business and IT alignment, and to realise an approach to assess this alignment. More focus has been placed on theoretical and practical approaches that have taken intangible social perspectives as influencing factors that impact on the alignment between business and IT. Critiques over chosen principles and approaches have been produced by the end of the chapter, which support the development of the proposed method to achieve the aim of the research.

3.1 Theoretical Approaches for Establishing the Alignment between Business and IT

Extant approaches for establishing alignment between business and IT have been derived from both research and practice. It is important then to review different approaches that are discussed within these two perspectives to highlight the strengths and weaknesses of their implementation in organisational operation. Both research and practice approaches complement each other as the lack in one perspective can be complemented by the other. For example, a lack of functionality of practical tools may be caused by a lack of concrete theoretical underpinning that is clearly defined in the research perspective. Although practical approaches provide convincing evidence of their usability in real-world contexts, establishing the alignment of business and IT from the research perspective allows for a systematic development of a methodological approach that can be scientifically verified through verification and validation processes. However, the practicality of such synthesised methods might be questioned for its lack of implementation in a real-world setting. Thus, having a holistic approach that considers the strengths of both perspectives would be an ideal approach to establish an optimised mechanism for business and IT alignment. Well-known

business and IT alignment approaches are discussed in the following sections.

3.1.1 The Strategic Alignment Model

The Strategic Alignment Model (SAM) of Henderson and Venkatraman (1993) is a dominant model in the literature on business and IT alignment (Chan and Reich, 2007b). It has been applied and critically studied as a seminal model to establish business and IT alignment (Luftman and Brier, 1999, Gutierrez and Serrano, 2008). It has also received support from practitioners and industry professionals and is recognised as the most widely accepted model in business IT alignment research (Ullah and Lai, 2013). A recent review of IT alignment literature highlights that many researchers have considered the paper of Henderson and Venkatraman (1993) as not only a seminal, but also a transformative publication in the Information Systems field (Coltman et al., 2015).

As illustrated in Figure 3.1, the concept of alignment in the SAM emerges from some form of fit between IT strategy, business strategy, IT infrastructure and processes, and business structure and processes. It describes the alignment of business and IT at the external level to strategize the organisation's objectives and then realise these objectives through the organisation's strategic fit with IT resources and business operations in the internal level of the organisation (Henderson and Venkatraman, 1993). Business and IT drivers can be translated from the strategic plans to the organisational operations, supported by strategic fit. In addition, cross-relationships are clearly indicated between different internal and external levels of different domains (i.e. business and IT domains).

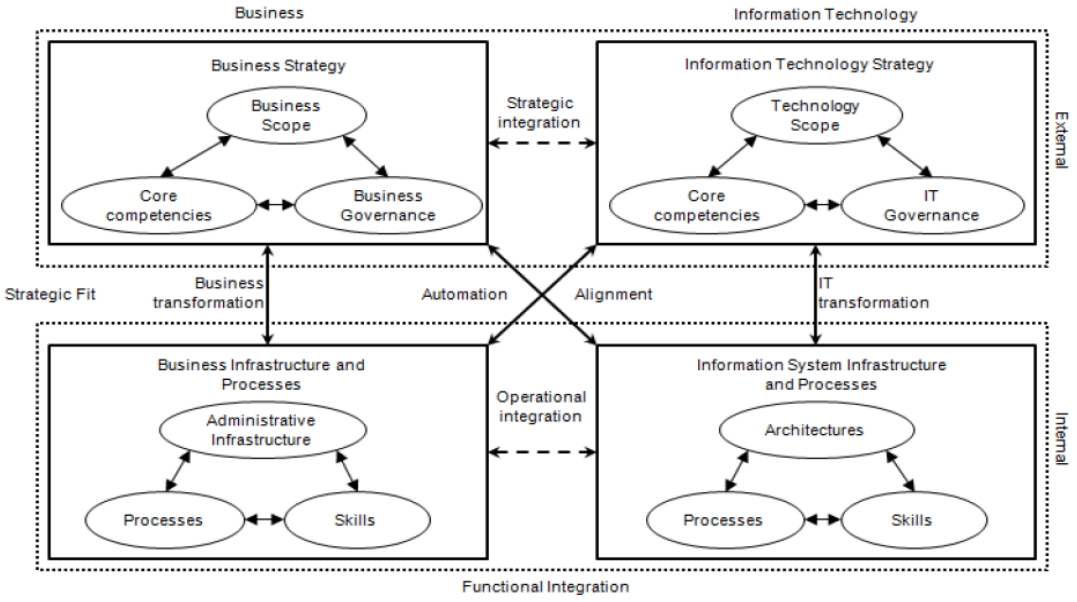

Figure 3.1: The Strategic Alignment Model (Henderson and Venkatraman, 1993)

It is assumed in the SAM that the dynamics of IT alignment are to be adapted as a continuing process in which IT responds to changes in the business and vice versa (Reynolds and Yetton, 2015). The alignment between business and IT domains in this model is illustrated as strategic and operational integrations. The strategic integration at the top level is established through linking business and IT scopes, competencies and governance so as to have a unified strategic organisational plan. On the other hand, the operational integration at the lower level is established through the links of aspects of the internal business domain with the IT architecture. The business domain includes the administrative infrastructure, business processes and skills of involved people. The IT architecture, on the other hand, comprises appropriate IT skills and associated processes that are essential to ensure internal organisational harmony between business needs and the delivery of IT capabilities. For the purpose of this research, to align business and IT at the organisation's operational level, principles from Task Technology Fit theory (discussed in Section 3.4) are adopted to describe the operational integration as a degree of fit between business operations and supporting IT resources.

Henderson and Venkatraman (1992) describe the importance of having a bi-directional alignment of both internal and external levels for achieving successful alignment. Phillips (2007) in agreement with the view of the alignment described in SAM, points out the need to build a continuous review process and contingency-based planning in order to achieve business and IT alignment. The focus is placed on reviewing communication through using top-down and bottom-up analysis approaches. The former facilitates the communication of the business needs for IT supports as derived from business and IT strategies, while the latter communicates the value of available IT resources with regards to business operations to determine if they comply with strategic plans. This bi-directional review of communication between strategic and operational levels helps to ensure the effectiveness of the role of IT in the organisation. Particular emphasis is placed on communication between individuals who are assigned specific roles in the business and IT domains of the organisation. Effective communications would then influence the holistic alignment between business and IT in the organisation. Therefore, bi-directional communication does not only ensure effective connections between both strategic and operational levels in regard to the role of the IT in the business, but also supports the importance of the assessment of business and IT capabilities at the operational level.

Four alignment perspectives have been defined in SAM that include strategy execution, technology transformation, competitive potential and service level (Henderson and

Venkatraman, 1993). These perspectives describe the alignment between business and IT domains within the strategic and operational levels of an organisation from different angles of focus. They are also interrelated to form the complete alignment between the business domain and IT domain in the organisation. The two perspectives (i.e. technology transformation and service level) are emphasised as they particularly reflect on the importance of establishing business and IT alignment at the organisation's operational level. Figure 3.2 illustrates the technology transformation alignment perspective, which seeks to identify best possible IT competencies through appropriate allocation of these competencies in the organisational IT strategy plan.

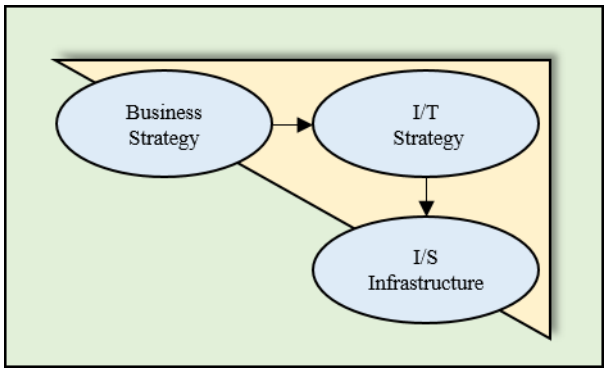

Figure 3.2: Technology transformation alignment perspective (Henderson and Venkatraman, 1993)

On the other hand, the service level alignment perspective as shown in Figure 3.3 aims to build a world-class IS service organisation. It focuses on the effective use of IT competencies to support business operations as outlined in the IT strategy. This focus of alignment between business operations and IT resources at the organisation's operational level triggers the need for their assessment with a view to optimising the benefits from IT investments in the organisation.

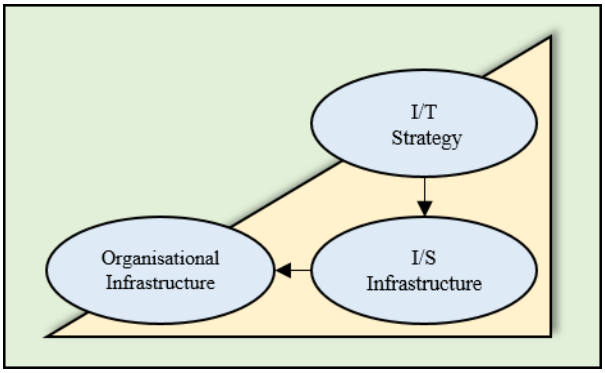

Figure 3.3: Service level alignment perspective (Henderson and Venkatraman, 1993)

Although SAM provides an approach to think about whether IT strategy is informed by the

business strategy and vice versa, it has been argued that this model is too rigid to adopt in terms of establishing alignment between business and IT (Vargas Chevez, 2010). It has also never been used as a measurement tool for IT alignment assessment due to its proven complexity to be operationalised (Coltman et al., 2015). Therefore, the necessity of having a more dynamic approach for establishing alignment between business and IT was proposed in the IT alignment literature.

Vargas Chevez (2010) proposes a unified strategic alignment model based on four established business and IT strategic alignment models. The proposed model represents a set of key aspects that are necessary to achieve strategic alignment between business and IT. The key aspects are modelled within the organisation to describe the current and future targeted scenarios of business and IT alignment. Although these aspects can be used as a reference in modelling business and IT alignment, no specific systematic approach is defined or offered to realise those aspects for implementation.

3.1.2 The Unified Framework

Significant efforts to enhance SAM have been undertaken by many researchers motivated by the argument that SAM is not sufficient to support the complex nature of business and IT alignment (Boonstra et al., 2011). Maes et al. (2000) highlight the involvement of intangible factors such as political and cultural aspects as significant contributors to this alignment complexity. They then extend SAM by offering a Unified Framework for business and IT alignment (see Figure 3.4), which is developed based on SAM and the Integrated Architecture Framework (IAF), (the latter is discussed Section 3.3.3). The Unified Framework emphasises the importance of analysing the operational level of an organisation in order to address alignment challenges between business and IT. This is because the role of relevant human actors, known as stakeholders at this level, is not adequately recognised in establishing the alignment, where the involvement of different actors assigned to different roles in both business and IT domains makes a significant contribution to the increased complexity of the alignment. This motivates the development of a mechanism that can communicate those actors and represent their influences within the alignment between business and IT.

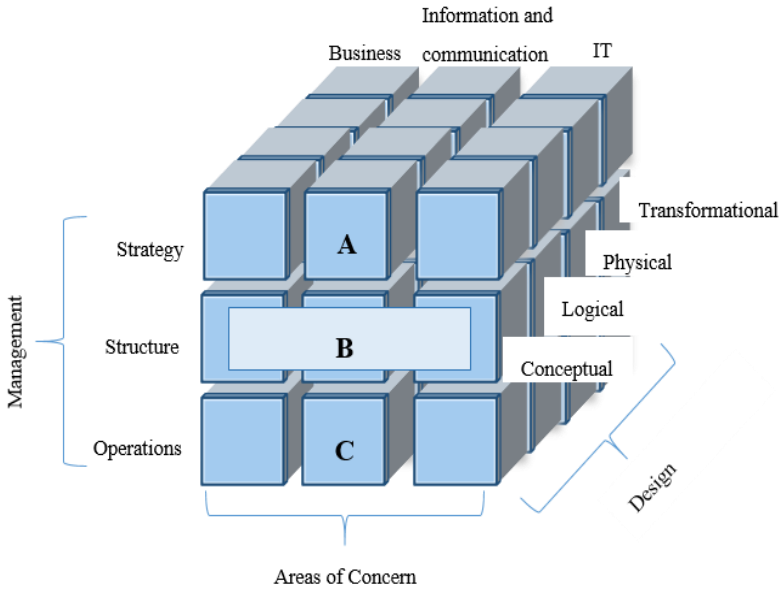

Figure 3.4: The unified framework for alignment (Maes et al., 2000)

As illustrated in Figure 3.4, the necessity of a mechanism to align business and IT at the strategic level is represented in the box labelled 'A'. The communications of information within the alignment between the strategic and operational levels are represented in the set of boxes labelled 'B'. Although there is no clear definition of a mechanism to handle these communications in the alignment, the middle level between the operational and strategic levels in Figure 3.4 acts as a connection broker to mediate the business-IT alignment at the strategic level to be performed by the business-IT alignment at the operational level. The box labelled with 'C' indicates the structure for managing the alignment between business operations and supporting IT resources in the organisation.

The focus of the alignment in this model is to be established through communication layers that are located between business and IT domains from one side, and between the strategic and operational levels from the other side. Stakeholders who are involved in the communication layer between business and IT have influence towards the establishment of the business and IT alignment since they are involved in handling the communication efforts between business and IT. Nonetheless, the practicality of the communication layer as a tool to establish alignment between business and IT is restricted in this model due to its unspecified description of the alignment (Luftman et al., 2017).

In order for organisations to be successful in rapidly changing business and IT environments, it is essential that they have effective and efficient IT resources to support business operations (Silvius, 2009). This can be achieved through a coherent alignment between business and IT at the operational level and, once they are coherently aligned, business

values from IT can be rationally realised (Wagner and Weitzel, 2012). However, realising the level of alignment between business and IT at the operational level requires continuous assessment of the effectiveness of IT resources in supporting related business processes, to determine the degree of fit of these two domains. Principles from Service-Oriented Architecture, Enterprise Architecture and Task Technology Fit theory are discussed in the following sections as enablers of business and IT alignment.

3.2 Service-Oriented Business-Aligned IT

The emergence of Service Orientation Computing (SOC) has provided a paradigm shift in business thinking where business competencies are exposed and offered as services (Brahe, 2007, Kohlborn et al., 2009), and those services are mainly focused on customers' requirements (Chesbrough and Spohrer, 2006, Clarke and Nilsson, 2008, Larson, 2008). SOC aims to utilise services as basic blocks to support the development of low-cost, rapid, secure and reliable applications (Papazoglou et al., 2008). Therefore, the need to develop new software solutions for new business processes that emerge is reduced (Wei and Blake, 2010). The promise of SOC is a world of cooperating services in which application components are gathered into a network of services to develop flexible dynamic business processes and agile applications that can not only span organisations, but also computing platforms (Papazoglou et al., 2008).

Service-Oriented Architecture (SOA), as a major element in the service orientation (Erl, 2008), provides a means of reorganising a collection of software applications and infrastructure into an interlinked set of services (Papazoglou, 2003). Highly flexible and simple architecture are two main goals that are addressed in SOA (Khoshnevis et al., 2009). It is one of the most predominant architectural styles (Khoshnevis et al., 2009) that considers each business or system as a collection of service providers; each offering one or more services (Alwadain et al., 2010). Those services are increasingly becoming one of the most valuable assets of organisations. Therefore, they need to be integrated in the enterprise architecture (Khoshnevis et al., 2009).

Although a large number of publications associate SOA concept with the technical domain, many authors have also emphasised the benefits of applying the concept similarly in the business domain in order to enhance business models (Kohlborn et al., 2009). Hence, the concept of SOA is applicable to both business and IT domains and can be observed as a comprehensive approach for a complete organisation (Cherbakov et al., 2005, Brown et al., 2002). A comprehensive and integrated approach that supports the derivation of business

and IT services to achieve better alignment between business and IT is suggested by Kohlborn et al. (2009). They argue that the widespread use of service concept on both business and IT brings the demand for a comprehensive, integrated service driven approach to ensure business and IT alignment. This research aims to address this point by devising a method that enables the derivation of business and IT services following SOA principles to facilitate the alignment evaluation of these services. The decomposition of an organisation's business into business components that are well bounded and discrete allows for better understanding of complex business and therefore facilitates the realisation of business intent by IT (Flaxer and Nigam, 2004).

Organisations that adopt SOA are usually more dynamic in coping with changes from the business environment (Liu and Li, 2014). In this sense, an organisation can easily remove or redesign underperforming business services without affecting other parts of the business. Similarly, IT components that are ineffective can be rationalised without disturbing business operations. Service orientation rationale is adopted to represent business services and IT services in an organisation's operational landscape. It is anticipated that an enhanced value of the organisation's business can be realised when both business and IT are represented as services (Rosen et al., 2012). This enhancement is realised through modelling business and IT according to business-centric SOA principles that enable the mapping of business functions to technical implementations (Luthria and Rabhi, 2009). This facilitates the automation of business rules and aligns the business with IT.

3.2.1 The Principles of Service-Oriented Architecture

The conventional view of business and IT alignment at the operational level is generally focused towards the lowest level of business processes supported by IT capabilities to optimise business process performance (Jurisch et al., 2012, Maij et al., 2002). However, the emergence and increased adoption of SOA have changed the way business operates and challenged organisations to redesign their business and IT resources into services that enable the establishment of their alignment. Thus, it is critical for organisations to align their IT systems through SOA in order to provide virtualised IT services and end-to-end organisational integration (Bieberstein et al., 2005). The behaviour of each service is therefore conceptually formed by a set of design principles that characterise it. The main characteristics of a service that is based on SOA include its clarity, level of abstraction, ease of discovery and invocation and a fully defined contractual interface that is associated with it (Bieberstein et al., 2005). Erl (2008) defines a set of SOA principles as illustrated in

Table 3.1.

Table 3.1: Service design principles (Erl, 2008)

Design principle	Definition
Standardised service contracts	"Services within the same service inventory are in compliance with the same contract design standards."
Loose coupling	"Service contracts impose low consumer coupling requirements and are themselves decoupled from their surrounding environment."
Abstraction	"Service contracts only contain essential information and information about services is limited to what is published in service contracts."
Reusability	"Services contain and express agnostic logic and can be positioned as reusable enterprise resources."
Autonomy	"Services exercise a high level of control over their underlying runtime execution environment."
Statelessness	"Services minimize resource consumption by deferring the management of state information when necessary."
Discoverability	"Services are supplemented with communicative meta data by which they can be effectively discovered and interpreted."
Composability	"Services are effective composition participants, regardless of the size and complexity of the composition."

These principles guide the modelling of business and IT elements at the operational level of an organisation in a service-oriented means. They characterise a service as an independent, unique and agile element. Therefore, a clear representation of the organisation's operational level can be obtained.

Among those principles described in Table 3.1, four are highlighted to guide the modelling of business and IT in an organisational operation in a service-oriented manner. These principles include Service Autonomy, Discoverability, Composability, and Reusability. Figure 3.5 illustrates those principles that describe the behaviour of a service as an independent and flexible element, which are essential characteristics for having a clear representation of the organisation's operational landscape.

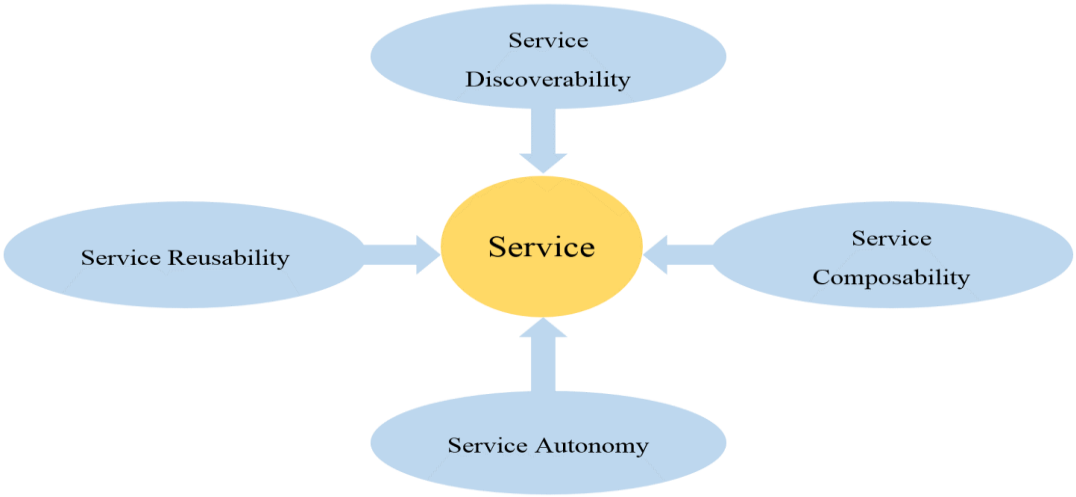

Figure 3.5: The four principles that characterise a service (Erl, 2008)

The service autonomy principle refers to the ability of the service to be independently carried out. This characteristic illustrates the reliability and predictability features of the offered service (Dimakis et al., 2006). On the other hand, the service discoverability principle specifies that the service has to be clearly defined to facilitate its interpretation by people who are involved in the organisational operation. This clarity of defining services makes them visible resources to be discovered within the organisation (Reddy et al., 2009). Therefore, modelling business and IT elements based on these two principles would allow for a stable and clear description of business and IT services at the operational level of an organisation.

Nevertheless, services have less value when they are isolated (Rosen et al., 2012). Rather, the value lies in their ability to be composed with other services so as to create an agile organisation that is capable to achieve ultimate business goals. This composition of organisational services is reflected in their ability to be composed and decomposed according to the specified purpose of the service offered. The composition of the organisation's existing services can create new enhanced services (Bieberstein et al., 2005, Chen, 2008, Crawford et al., 2005). In addition, composite services may further be recursively combined to produce even more services to satisfy potential business needs (Cherbakov et al., 2005). This compositional feature promotes service agility, which is essential to ensuring sustainability of business and IT when changes occur at the operational level of an organisation (Papazoglou and Van Den Heuvel, 2006).

Finally, service reusability, which refers to the ability of services to reuse the defined capabilities of a given service (Choi and Kim, 2008). The reliability of services that have been built through reusing existing services will be increased due to the fact that these services have already been used before (Gill, 2006, Sridhar, 2015, Soni and Jha, 2014). In addition, reusing existing services will result in a reduction in market time, which is beneficial when the business environment is very competitive (Soni and Jha, 2014). Furthermore, efficient use of the organisation's operational capabilities promotes efficient description of the business and IT elements in the organisation (Feuerlicht, 2007).

High levels of service reusability and composability would be ideal for an organisation's operational level. This allows more flexibility and stability in the organisational operation to cope with constant changes in the business and IT environments. However, managing the performance or the value of the compositions is difficult, especially when the number of combined services is high. This may hinder the efficiency of adopted SOA principles with regards to modelling business and IT elements at the operational level of an organisation.

The discussion of the four SOA principles to describe a service supports the applicability of these characteristics for describing business and IT resources at the organisational operation. Further clarification of the complex operational landscape can be obtained from a proper representation of business and IT through service-oriented concepts. Thus, service-oriented organisational operation allows the organisation to have a clear impression of the complexity of its operational landscape, especially in viewing the relationships between business and IT aspects that have an enormous impact on the operational performance of an organisation.

3.2.2 Defining Business and IT Services at the Operational Level

The term 'service' has been defined in a variety of ways in the context of SOA (Atkinson et al., 2005). However, the involvement of multiple agents (i.e. service consumers, service providers and service intermediaries) in a service-oriented environment requires a common understanding of service definitions (Crawford et al., 2005). This need for a commonly accepted service definition applies within each business domain as well as across domains. In order to highlight the essential features of a service in an SOA, Atkinson et al. (2005) reviewed several definitions and pointed out that services are modular, loosely coupled, technology neutral and location transparent. The definition of Papazoglou (2003) is found to meet these features as he defines a service as a self-contained, platform-independent, computational component that supports rapid, economical composition of distributed applications.

These services are executed and managed in a flexible and scalable IT environment and operated by following Service Level Agreements (SLAs) and governing policies (Bieberstein et al., 2005). Functions that range from simple requests, such as order tracking, to more complicated business processes are performed by services which allow organisations to expose their essential competencies through self-describing interfaces using standardised protocols such as the Web Service Description Language (WSDL) (Papazoglou, 2003). They can be invoked either separately or as a composition of multiple services through access protocols such as Simple Object Access Protocol (SOAP) and Representational State Transfer (REST). They may also be delivered from different service providers and the exchange of program data and information can be achieved through the use of mark-up language techniques, such as Extensible Mark-up Language (XML) (Wei and Blake, 2010).

Kohlborn et al. (2009, p.1) state that "*Since the operations of an organization can be analysed on different granularity levels, business services can represent these operations on different levels as well*". In this research, business services are defined to match a fine-

grained definition of IT services as suggested by Flaxer and Nigam (2004). Each business service encapsulates business capabilities that are performed through business processes to implement a business strategy and provide value to customers (Sun et al., 2014). Within defined business processes, stakeholders are assigned specific roles and responsibilities to achieve strategic objectives (Barjis, 2009). Similarly, each IT service encapsulates an IT application with its associated technical components and IT infrastructure (Van Eck et al., 2004) (see Figure 3.6). Within an IT service, a software service is defined in this research as an IT Application Component (ITAC) that describes a part of an IT application system that can be separately consumed by multiple business services (Kohlborn et al., 2009).

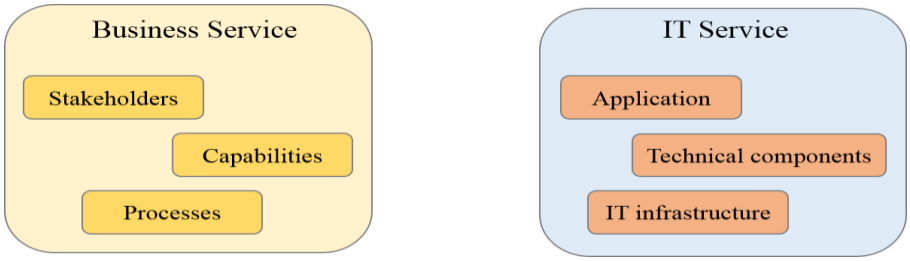

Figure 3.6: An illustration of business and IT services

In the context of an organisational operation, a service can be conceptually defined as information that is processed to add value to the organisation (Chen, 2008). Articulating various information from both business and IT elements in the organisational operation can provide the information requirements to describe business and IT services through independent schemas. For each business and IT service schema, the information is clustered into a single unit that is processed to create value for the organisational operation. Each single unit cluster describes only one service that performs a specific purpose to create value (Xin, 2009).

Business elements are transformed into business services as illustrated in the business service schema in Figure 3.7. For each business service, this schema describes the name of the service with a creation date and a reference number for future retrieval, a description of the business service offering, the goal that must be achieved by the business service, the type of business service as either primary or secondary, the norms by which the business service is governed, the business processes that describe the set of activities that have to be accomplished to deliver the business service value, the set of KPIs that are realised by the performance of the business processes, the capability of the business service in terms of its efficiency and effectiveness, the value of the business service to its customers, the IT resources that are required to support the performance of the business service as Information Systems Capability (ISC), and finally the relationship of the business service with other

business services. Consistent description of an organisation's services facilitates their valuable composition to satisfy different business needs.

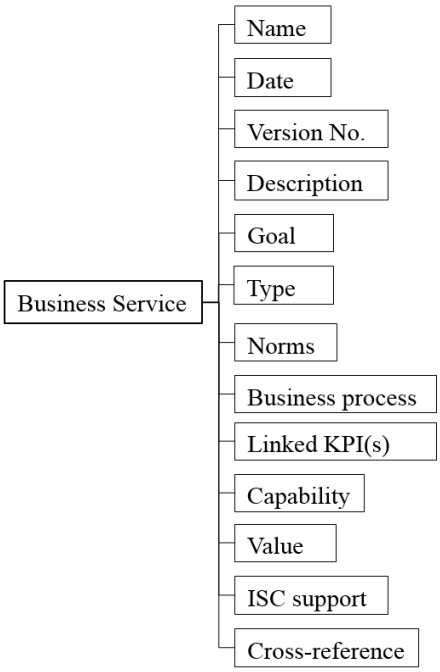

Figure 3.7: Business service schema

At the same time, IT elements are transformed into IT services. Figure 3.8 illustrates an IT service schema that describes for each IT service, the name of the IT service with a creation date and a reference number for future retrieval, a description of the IT service, the IT application that is involved with the IT service along with supporting IT technical infrastructure, and the technical specifications that are required to consume the service.

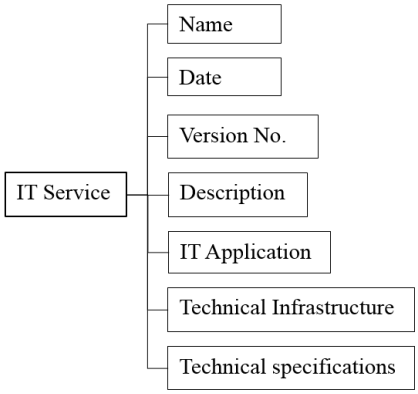

Figure 3.8: IT service schema

These business and IT service schemas capture basic information for describing business and IT services at the operational level of an organisation, which enables clear representation of these services' capabilities. Based on these schemas, business and IT service profiles are shaped which are further discussed in Section 3.5.

3.2.3 Business and IT Services at Higher Education Institutions

In recent years, the higher education sector has gone through massive changes all over the world in terms of governance, policies, structure and status moving towards the marketization of the sector (Brown, 2015, Nicolescu, 2009). These changes have been influenced by environmental factors that include internationalisation, privatisation, decentralisation and the increasing competition between Higher Education Institutions (HEIs). As a result, the way HEIs operate has changed and teaching, learning and academic supporting activities are being offered as services (Huisman, 2007). The quality of these offered services has become very critical to HEIs, and they are usually linked with the satisfaction of students, who are considered the direct and immediate customers of these services (Nicolescu, 2009).

Teaching and Learning (T&L) services at HEIs can be defined as the capacity of an institution (including its academic and non-academic staff, facilities, and infrastructure, etc.) to not only deliver pedagogical modules to its customers (i.e. students), but also to produce powerful learning environments that enable those customers to solve problems and construct new knowledge by themselves (Barr and Tagg, 1995). A list of major T&L activities that are widely practiced in HEIs and are offered as services is shown in Table 3.2.

Table 3.2: A list of major teaching and learning activities performed in HEIs

T&L activities	Sub activities	Authors
Pre-instruction	Material selection. Assign students into groups. Arranging classroom. Assigning roles.	(Johnson, 1994)
Instruction	Presentation and demonstration of new content. Supervising work on assignments and providing feedback. Assessment.	(Veenman et al., 2003, Brophy, 1987, Rosenshine, 1983)
	Teaching. Recitations. Discussions. Testing.	(Brophy, 1987)
	Re-teaching.	(Rosenshine, 1983, Brophy, 1987)
Hall and course management	Establishing rules and procedures. Arranging the physical setting. Maintain attention in the academic activities.	(Brophy, 1987)
Student socialisation	Articulation of ideas. Communications of expectations. Reinforcing desirable behaviour.	(Brophy, 1987)

Other services that are being recently provided by HEIs to current and prospective students include Student Management Services (SMSs). Some of these services might directly or indirectly support T&L services and therefore enhance the overall services offered to

students. These services range from application submission and course registration to other services related to campus cards, examinations, transcripts, grading and graduation services (Martin, 1999, Boettcher and Cartwright, 1997). This research, through a real-life case study, focuses on a subset of these core T&L and SMSs to evaluate their alignment with supporting IT systems.

Many HEIs in recent years have invested in student management systems to assist for providing highly efficient SMSs. These systems vary in terms of size and the capabilities that they offer (Paulsen, 2002) and, therefore, they may include some or all of the functionalities that are listed in Table 3.3.

Table 3.3: Major functionalities of student management systems

Student management systems' functionality	Authors
Application and admission procedures handling. Fees payment handling. Enrolment in core and elective modules. Timetables management. Access to examination information. Handling inquiries from prospective students. Handling assessments, marks and grades. Monitoring academic progress. Maintaining records of students, absence and attendance.	(Paulsen, 2002) (Ayoola et al., 2008) (Navalta and Mendoza, 2013)

Recent case studies indicate that the adoption of ICT in HEIs has positively affected teaching and learning processes (e.g. Zweekhorst and Maas (2015), Forkosh-Baruch and Hershkovitz (2012), and Wastiau et al. (2013)). This has pushed many HEIs around the world to heavily invest in advanced technologies to not only enhance teaching and learning activities, but also to effectively manage students, staff and assets. The University of Reading in the UK, for example, has invested in the Blackboard Learn system to provide T&L support to the university's students and academic staff. It offers the following functionalities (Blackboard, 2016):

- Creating, delivering, managing, assessing and grading courses online.
- Preventing plagiarism.
- Receiving quick feedback with institution surveys.
- Providing staff with access to social learning and access to Blackboard's global learning environment.
- Facilitating the ability to build rich online courses quickly.
- Consolidating students' work with online portfolios.
- Allowing students to participate and collaborate anywhere with mobile access.

For other SMSs, the University of Reading has invested in a student management system

called SITS that is developed by Tribal Group. This system is used by more than 65% of HEIs in the UK (Tribal Group, 2016). It is internally named as RISIS, which stands for Reading Integrated Student Information System. RISIS provides "*appropriate access to University of Reading student data for staff, students, postgraduate applicants and past students*" (University of Reading, 2016). More specifically, the major functionalities that are provided by RISIS are listed below (University of Reading, 2016):

- Admission procedures and application inquiry handling.
- Modules information.
- Fees payment handling.
- Room booking.
- Timetabling.
- Accommodation arrangements.
- Online enrolment.
- Examination information and processes.
- Statistical information.
- Help and support for students and staff.
- Training courses registration.
- Graduation and alumni.

RISIS is integrated with other IT applications at the university such as timetabling application, housing application, etc. to provide a single access point to student and academic staff services.

An overview of the main higher education activities that are being offered today as services in HEIs is provided in this section. Supporting ICT solutions that are being widely adopted by HEIs to enhance the quality of offered services and increase students' satisfaction are also discussed. However, the quality of services offered in this sector can be heavily influenced by the efficiency and effectiveness of business processes that are executed to produce these services.

3.2.4 Business Process and Business Process Modelling

Each business service must have at least one underlying business process that specifies the activities that have to be executed to deliver the business service value (Kohlborn et al., 2009). Davenport and Short (1990, p.4) define business processes as "*the logical organisation of people, materials, energy, equipment and procedures into work activities*

designed to produce a specified end result". Hammer and Champy (2009) provide another definition that takes customers into account and define a business process as a set of activities that transforms one or more kinds of inputs into outputs that are of value to the customers. The output or business value can be based on one single business process or multiple interrelated business processes (Kohlborn et al., 2009). Therefore, the performance of an organisation can be highly dependent on the business processes' collective capability to effectively achieve business strategies and objectives (Heidari et al., 2011).

Business processes can fall under two main categories: concurrent and sequential business processes. While both processes group a set of activities to be executed to produce a defined set of products or services, processes in the former are executed in parallel, while in the latter they are consecutively executed (Mohanty et al., 2003). Concurrent business processes are designed for speedy or other administrative reasons. However, they require integration in order to be executed in a timely, cooperative and cost-effective manner (Vernadat, 2002). Sequential business processes are complicated and require high levels of coordination and planning since the output of one process will be an input for another process (Fathee et al., 1998).

Business processes are deemed efficient when the inputs are converted into outputs in the shortest time possible with minimal utilisation of resources, while they are deemed effective when they satisfy one or more business objectives and meet or exceed stakeholders' requirements (Trischler, 1996). In this research, the efficiency of business processes in terms of meeting time and resource constraints is objectively evaluated. These processes are also subjectively evaluated through the perceptions of relevant stakeholders to determine the level of their effectiveness in terms of meeting stakeholders' needs and expectations.

The modelling of business processes through available modelling techniques provides a standard means of presenting and communicating business processes. This presentation of business processes provides the basis for systems integration in organisations (Heidari et al., 2011). There is a large number of business process modelling techniques or languages capturing different aspects of a business process (Vergidis et al., 2008). Each of these modelling languages has its advantages and disadvantages. Business Process Modelling Language (BPML), Integration DEFinition (IDEF), Unified Modelling Language (UML) and Business Process Modelling Notation (BPMN) are just some examples of these modelling languages. Authors such as Aguilar-Saven (2004), Kettinger et al. (1997) and Melão and Pidd (2000) have extensively discussed and classified different business process modelling languages.

In this research, the BPMN is adopted as a graphical flowchart language to model business processes. This language enables business process representation in an intuitive form (Havey, 2005). The aim is to provide a simple and clear snapshot of a business process flow along with its constrains in terms of time and resources. Once business processes are optimised and improved, organisations can establish a leading edge by reducing costs, improving quality and efficiency, and enhancing adaptation to changing requirements (Vergidis et al., 2006). This is because the quality of business offerings can be naturally affected by the quality of the business processes that belong to the business environment, due to the fact that these processes should provide some kinds of outputs to the surrounding environment (Heidari et al., 2011).

3.2.5 Relationships between Business and IT Services

The ability to describe business and IT elements as independent services has been supported by principles adopted from service-oriented architecture. As a result, the ambiguous nature of the tightly coupled business and IT aspects at the operational level of an organisation is clarified, which enables the distinct representation of business and IT aspects. The composability and reusability characteristics allow interactions between services. For the operation of an organisation, then, a business service can interact with IT services and also with other business services. This promotes many-to-many relationships between services within the organisation (see Figure 3.9). According to Scheepers and Scheepers (2008), a single IT resource can impact multiple business processes. However, it makes it challenging to distinguish the IT resource that impacts a specific business activity or process (vom Brocke et al., 2014).

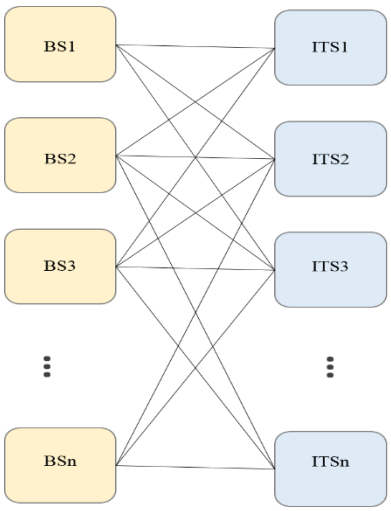

Figure 3.9: Representation of many-to-many relationships between business and IT services

The relationships between business and IT services can be chaotic due to the fact that one business service can be linked with multiple IT services and vice versa. These many-to-many links between different business and IT services illustrate that there is no clear differentiation between these linkages. This can be attributed to the absence of an explicit description for the logic of the linkages. In this context, business and IT services have to be logically mapped together in order to establish their alignment.

The mapping incorporates the requirements from a business service with the automation capability offered by an IT service. These requirements are important as they describe the objectives of the linkages between business and IT services. They can be represented as IS services that act as mediators for completing the linkages between business and IT services (Jiang et al., 2002, Sun et al., 2014). An IS service can then be described by the automation requirements from the business service and the technical capability provided by the IT service to support the business needs (see Figure 3.10). Well-aligned business and IT services can be the result of optimal mapping between business and IT services through IS services.

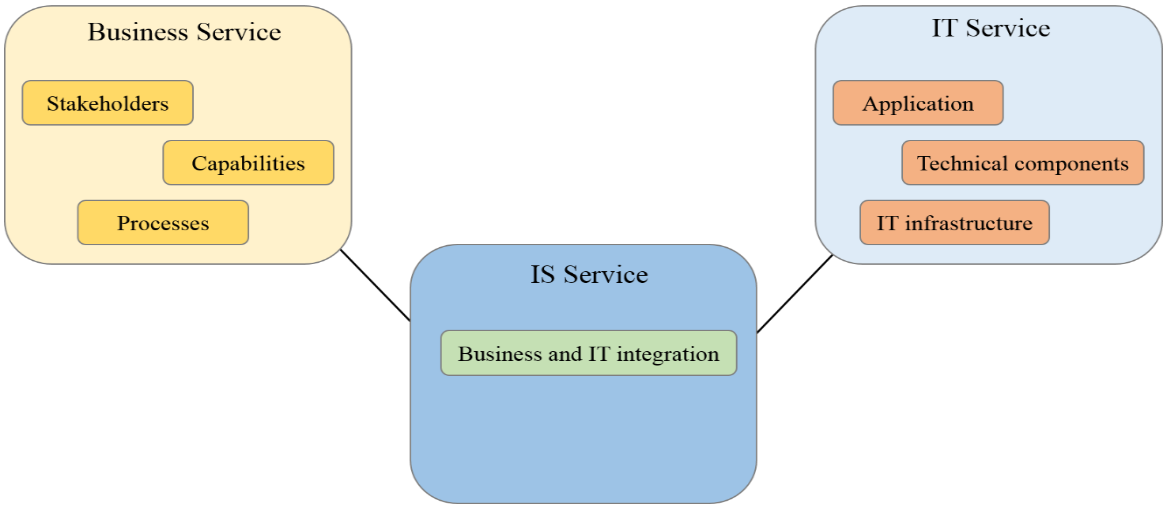

Figure 3.10: Mapping business services with IT services through IS service (Sun et al., 2014)

In recent years, business and IT alignment research has paid more attention to the concept of service orientation (Clarke and Nilsson, 2008). This enables the evaluation of business performance and IT capabilities to be conducted from a service perspective (Cherbakov et al., 2005, Hamidou Dia, 2010). Therefore, the adoption of service orientation in this research is not limited to managing the complexity of the connections between business and IT services, but also to determining the value of these services. Service values are not strictly linked to financial aspects such as increased profitability, but extend to business credibility,

performance and importance to the overall strategic goal achievement. Organisations are obliged to have unique or niche business offerings that somehow differentiate their value-adding and contribute to their sustainability in the industry (Boguslauskas and Kvedaraviciene, 2015, Hafeez et al., 2002). It is still, however, very important for these organisations to maintain information accessibility and accuracy of their offered services, which are prone to constant changes (Xin, 2009). This encourages effective operational management for the relationship between business and IT services in the organisation. Enterprise Architecture is found suitable to address this issue as discussed next.

3.3 Enterprise Architecture for Managing Business and IT Information

Enterprise Architecture (EA) is an emerging field and practice that aims to enhance the management and operations of complex organisations and their information systems (Lapalme et al., 2016). Principles from EA are adopted in this research for articulating and managing business and IT as independent entities in the organisation. A clear description of the entire organisation's operational landscape can then be supported by individually articulated business and IT concepts. Pereira and Sousa (2004) state that it is possible through EA to have a transparent documentation and management of the linkages between business and IT in the organisation. This clarity of the representation of the organisation's operational entities and their links facilitate their alignment. According to Liu and Li (2014), the adoption of EA to promote alignment between business requirements and IT capabilities is one of the primary reasons that EA is being adopted by many organisations around the globe.

EA offers a structural comprehensive mechanism for individual management of the description of business and IT concepts in an organisational operation. This individualistic description of business and IT concepts allows for better understanding of each concept as it is constructed in a systematic manner. Zachman (1987) emphasises that the increased level of complexity and size of information systems design in an organisation demands the use of logical architecture to define, integrate and control all the components of the system. Similarly, Armour et al. (1999) conclude that it is difficult enough with a development framework to ensure a coherent, consistent vision to guide the evolution of the information systems in the organisation. They argue that it is even impossible without having a framework.

There is a large number and huge variety of EA frameworks that have been discussed in the

EA literature (Matthes, 2011). According to Hinkelmann et al. (2016), The Open Group Architecture Framework (TOGAF) and Zachman EA framework are the most widely used EA frameworks. TOGAF provides a template with more detailed steps that eventually generate an EA. Zachman, however, does not provide any details for the implementation, but it provides a formal and highly structured approach for viewing and defining the organisation (Liu and Li, 2014). Regardless of the differences that exist between these two frameworks, both address system challenges as well as the alignment between business and IT (Hariharan, 2009). They are discussed next along with the Integrated Architecture Framework (IAF) as frameworks that provide principles to establish the description of business and IT in an organisation.

3.3.1 The Zachman Framework

The Zachman framework was formally published in 1987 (Zachman, 1987). It is a widely known EA framework that pioneered the underlining thinking for structuring the business and IT in an organisation. As illustrated in Figure 3.11, the framework provides a means of observing an organisation from several different viewpoints and demonstrates how these viewpoints are connected (Sowa and Zachman, 1992). This framework provides the guidelines of the different aspects that need to be taken into account when establishing the description of business and IT in organisations (Zachman, 1996).

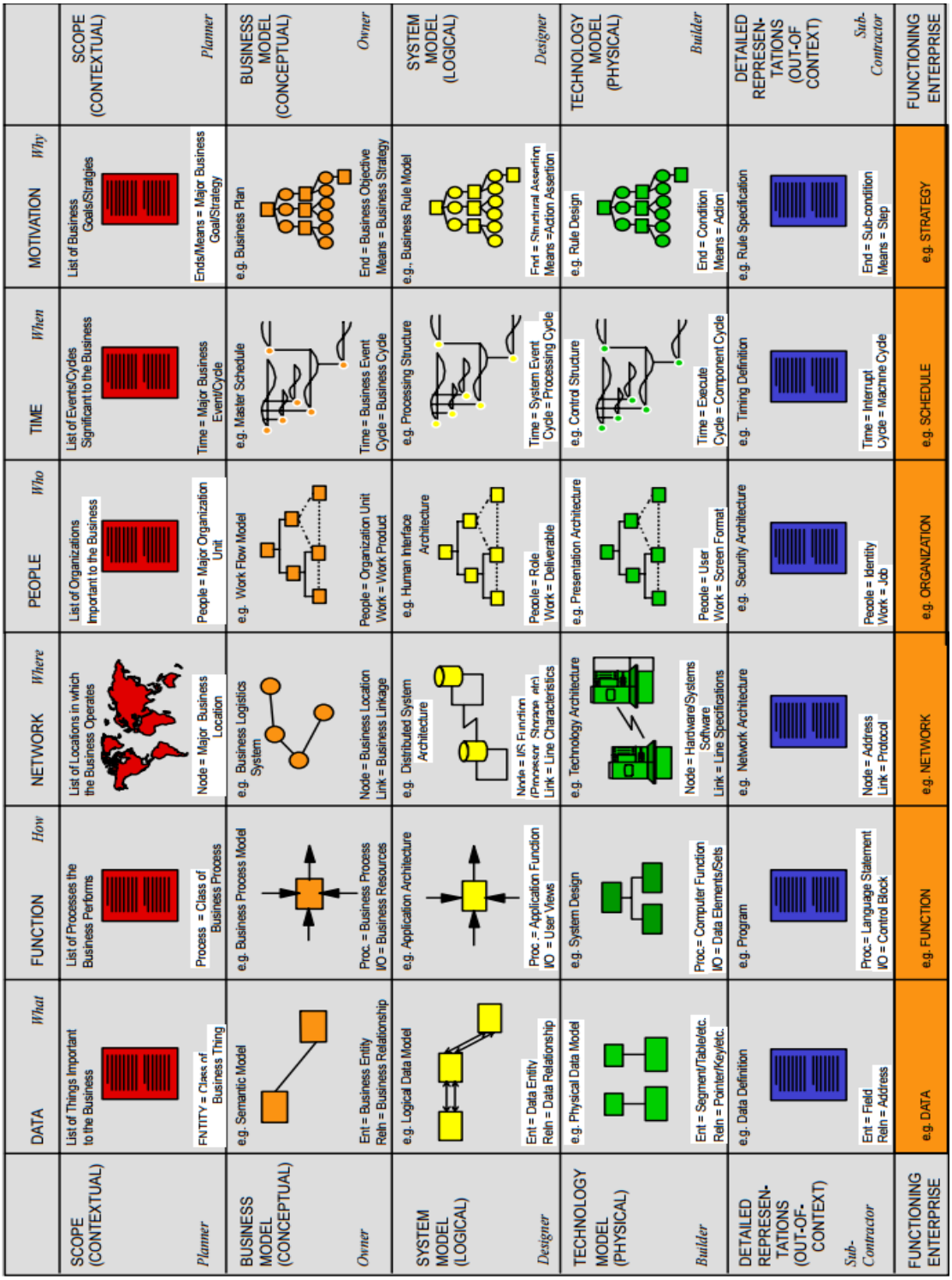

Figure 3.11: The Zachman framework for Enterprise Architecture (Zachman, 1996)

The Zachman framework, however, does not provide an approach to evaluate business and IT alignment at the operational level of organisations, nor a technique that can be utilised to assess the value of stakeholders. It also does not prescribe a set of models that can be followed when implementing the framework (Guijarro, 2007). This limits its practicality for the assessment of the value of business-aligned IT at the operational level of organisations.

3.3.2 The Open Group Architecture Framework

The Open Group Architecture Framework (TOGAF) is a well-known EA framework, which offers a detailed framework that comprises a set of supporting tools and a development method to assist the articulation of business and IT elements in an organisation. A key element offered in TOGAF is the Architecture Development Method (ADM), which specifies a process for managing articulated information of business and IT aspects in the organisation. Individual phases are described in the ADM as illustrated in the left side of Figure 3.12, which assist independent management of business and IT information. The relationships between phases are also described in this method to support the management of the alignment between business and IT.

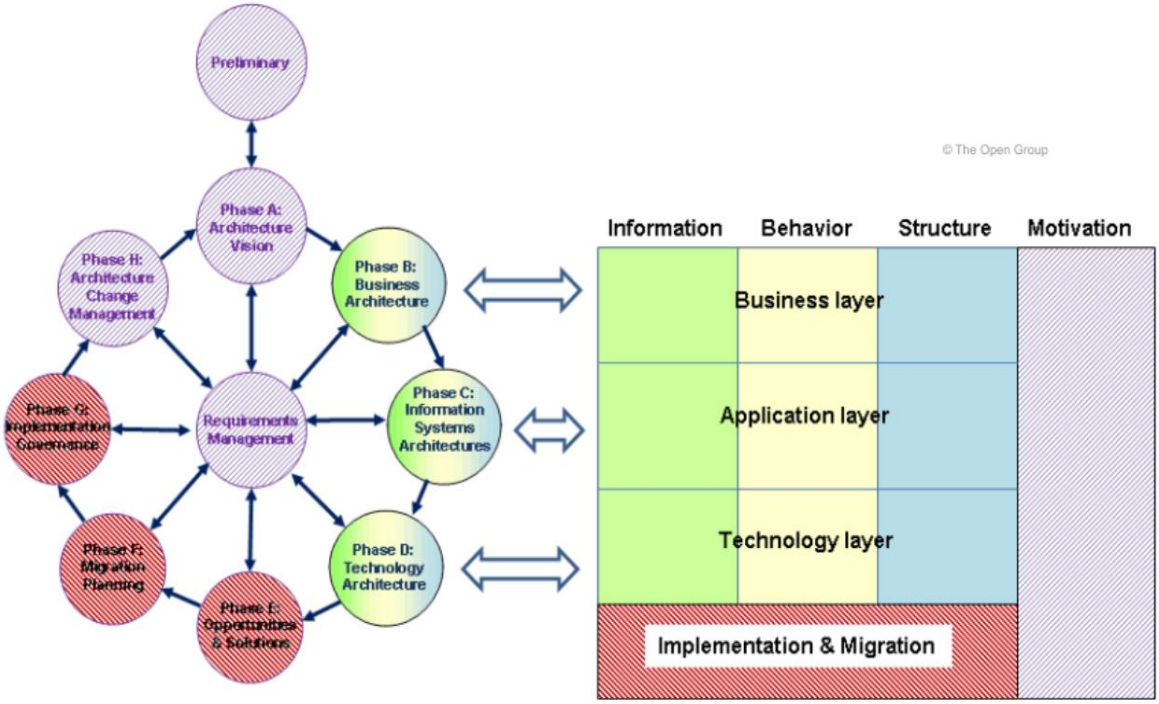

Figure 3.12: Correspondence between TOGAF-ADM (left) and the ArchiMate core framework (right) (The Open Group, 2013)

The set of phases described in the ADM is adapted to fit for the business-aligned IT environment at the operational level of an organisation. In this context, business service elements can be described in the *Business Architecture* phase, whereas IT service elements can be articulated in the *Technology Architecture* phase. The phase in-between, *Information Systems Architecture*, can then be utilised to guide the alignment between business and IT. The alignment status is then articulated in the *Migration Planning* phase for any potential modifications required for the IT aspects in order to maximise its value-adding to the organisational operation. Decisions to be applied for any modifications can then be managed

in the *Architecture Change Management* phase. The central *Requirements Management* process is where all relevant information from all phases is centrally managed.

3.3.3 Integrated Architecture Framework

Integrated Architecture Framework (IAF) is another EA framework that offers a structural approach to guide the development of models that support the articulation of business and IT aspects in the organisation (Wout et al., 2010). As indicated in Figure 3.13, the framework adapts the main principles outlined in Zachman in articulating the information based on the contextual, conceptual, logical and physical perspectives. The information is then categorised as business, information systems and technology infrastructures.

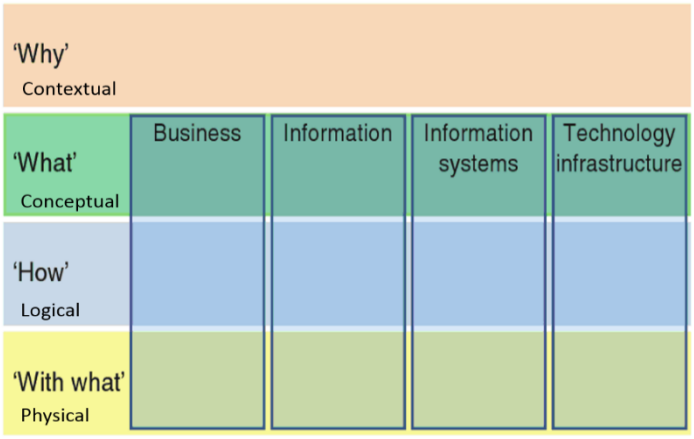

Figure 3.13: The Integrated Architecture Framework (Wout et al., 2010)

Such a tool can be used by analysts to identify, collect and analyse related information that is necessary in establishing the representation of the business and IT landscape (Urbaczewski and Mrdalj, 2006). It can also be used as a tool to manage a large volume of valuable information that is elicited from relevant stakeholders' knowledge, which influences the organisation's operational efficiency and effectiveness (van der Raadt and van Vliet, 2009). Although EA frameworks are widely accepted logical frameworks, the utilisation of these frameworks for precisely assessing the business and IT alignment at the operational level of organisations is not fully effective in practice. This is due to the focus of these frameworks on providing guidelines for managing strategic and organisational changes. To establish the fit between the right IT resource with the right business operation, principles from Task Technology Fit (TTF) theory, which are discussed in the following section, are adopted.

3.4 Task Technology Fit for Aligning Business and IT

Goodhue and Thompson (1995) define Task Technology Fit (TTF) as the degree to which a technology assists individuals in performing required tasks. They assert that technology must be both utilised and hold good fit with tasks it supports in order to have a positive impact on individuals' performances. Assessing the proper utilisation of IT can be achieved through users' beliefs in regard to the ability of an IT capability to support assigned task(s) (Dishaw and Strong, 1999). TTF is adopted in this research to assess the degree of fit of the utilisation of IT resources in supporting business operations.

The aim of TTF is the establishment of a consistent relationship between business needs, stakeholders' abilities and technology capabilities in order to contribute to the success of an organisational operation (Goodhue and Thompson, 1995). The achievement of correspondent interactions between aforementioned variables requires an assessment of business-aligned IT at the operational level of an organisation. Results of this assessment would illustrate the fitness level of the alignment between business and IT, reflecting on the value of IT resources in supporting business operations.

Since the principles of TTF are adopted for assessing the fitness of business-aligned IT in the organisational operation, it is essential to specify the exact type of fit in order to define the precise linkage between business and IT. Failing to do so may lead to incompatible, mixed or contradictory results of the alignment assessment (Bergeron et al., 2004). Different types of fit describe the alignment or linkage between business and IT. For instance, Venkatraman (1989) identifies six different types of fit that include *moderation, mediation, matching, gestalts, profile deviation,* and *co-variation,* each with a different underlying theoretical conceptualisation. The type of fit as "*moderation*" is adopted to describe the fit as that of a moderator in the relationship between two variables. The predictor variable is represented by business operations, while the dependent variable is represented by IT resources that enable the former. The strength of the linkages between these two variables is then illustrated through the effectiveness of the moderator to mediate them. Thus, the value of the business-aligned IT is reflected through the strength of their fit.

Once the business-aligned IT value is established through its type of fit, various values can be generated for a single IT capability that enables multiple business operations (Goodhue, 2006). This creates complexity to optimise the business and IT alignment. The TTF model is then adopted for its principles with the intention of structuring the fitness between IT resources and business operations at the operational level of an organisation (Goodhue,

2006, Goodhue and Thompson, 1995).

Figure 3.14 illustrates the TTF model, which is a theoretical model that is commonly used to evaluate how information technology leads to performance and usage impacts (Lu and Yang, 2014). It indicates that both task and technology characteristics can affect the task technology fit, which in turn determines users' performance and utilisation. Four main concepts are described in this model:

- **Task characteristics**: this concept defines the characteristics of business operations to reveal the needs for supporting IT resources.
- **Technology characteristics**: this concept defines IT capabilities as IT resources that enable business operations. Both task and technology characteristics are independently defined to attain the right information of the business and IT components that facilitates proper understanding of the fit between them.
- **Task Technology Fit**: this concept defines the alignment between business and IT, where the fit reflects the value of this alignment. The technology must fit the task it supports in order to have a performance impact (Lu and Yang, 2014).
- **Performance impacts**: this concept defines the impacts of fit on the performance of the business operations and IT resources.

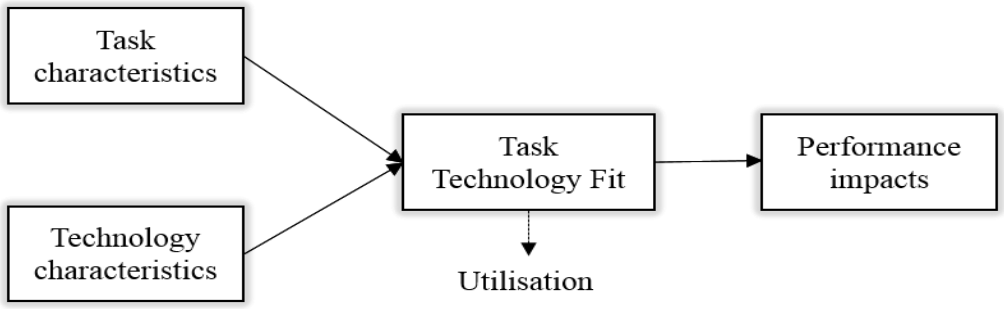

Figure 3.14: Task Technology Fit Model (Goodhue and Thompson, 1995)

The concepts outlined in the TTF assist with the representation of business and IT characteristics in profiles and also their linkages in fit profiles (Zigurs et al., 1999). However, it is found that the measurement of the fitness of IT in the business can be influenced by the attitudes and beliefs of human actors towards the deployed IT (Hartwick and Barki, 1994). This measurement is obviously subjective in nature and socially connected to stakeholders' perceptions towards business and IT alignment (Wong et al., 2012). A study conducted by Lam et al. (2007) on employees' behaviour addressed the impacts of social aspects on the interactions between deployed IT resources and enabled business operations. Issues

examined in this study include self-efficacy, personal attitudes and perceived beliefs of employees towards the adoption of IT to support business operations. The results show that social aspects positively enhance the adoption of IT in the business. Other characteristics such as the ease of use and usefulness of IT to the business (Davis, 1989) represent the strong influence of social aspects in the level of alignment between business and IT.

A set of factors has been defined in the TTF based on the impact of the social aspects on business and IT alignment. This set includes quality, authority, compatibility, timeliness, relationship, ease of use, reliability and utilisation; it can be used to measure the fitness of the business and IT alignment with regards to the organisational operation (Goodhue and Thompson, 1995). The set of tangible and intangible factors that are defined, studied and examined in this research, which are found to influence the level of alignment between business and IT, are discussed in the following section.

3.4.1 Evaluation Criteria to Assess Business and IT Alignment

The measurement of the fit of IT resources to support business operations requires the proper articulation of a set of factors or criteria that are relevant to the business and IT at the organisational operation. In order to acquire a holistic value for this measurement, multiple angles or perspectives of business operations and IT resources require measurement (Palmius, 2007). The focus on social aspects that are related to the business and IT has led to the definition of a set of intangible criteria, which are described as unquantifiable factors such as attitudes and feelings (Bei and Chiao, 2006). However, these intangible factors are not solely adequate for assessing the value of business operations, IT resources and the degree of fit between them. Thus, another set of tangible factors, which are quantifiable in nature, such as the number of IT application users (Whitten and Wakefield, 2006) are incorporated in order to obtain a holistic value of the alignment. Both sets of tangible and intangible factors represent the measuring requirements for a holistic assessment of the value of the business-aligned IT.

3.4.1.1 Tangible Factors that Influence the Value of Business-Aligned IT

Tangible factors are those which can be quantitatively measured and also referred to for objective decisions. They have been intensively applied in several assessment mechanisms to evaluate the quality of business and IT in organisations due to their ability to provide stable and strong evidence. Among these tangible factors are economic aspects such as the huge IT investments that are made by organisations to support business performance. Hitt

and Brynjolfsson (1996) define IT productivity, profitability and customer surplus as three economic factors that are essential for evaluating the financial value of IT resources. These financial factors influence the overall financial success of an organisation and, therefore, organisations are required to effectively and efficiently manage their IT investments. The technical quality of IT resources represents another tangible value by which the technical performance of IT performing specific functionality is measured. The value describes the quality of an IT resource to enable the automation of business operations, which influences the overall quality of business performance (Luftman et al., 1999). Finally, the frequency of utilising an IT resource in the business in terms of the number of times it is used or the number of users, which is another tangible factor that reflects on the quality of IT resources (Davis, 1989).

On the other hand, tangible factors that are related to the business domain include the position of a business service in an organisational setting according to the organisation's strategic plans. In this sense, business services can be categorised based on their value-adding potential to be either primary or secondary services (Porter and Millar, 1985). Primary services have a higher level of criticality to the organisation compared with secondary supporting services. In addition, the efficiency of business services is another tangible factor that reflects on the quality of provided services. The efficiency can be measured through the prompt delivery of business service value with minimal utilisation of resources (Trischler, 1996). This value provides concrete evidence of the business service performance. Sun et al. (2014) consider the level of criticality of the IT capability to support relevant business operations as a tangible factor that bridges these two domains together. The higher the level of criticality of IT capability to support related business operations, the more important the link between business and IT.

These tangible factors can provide hard and stable evidence for the value of business and IT alignment. However, they are not sufficient to determine the holistic value of business-aligned IT if intangible factors are neglected. Therefore, both tangible and intangible factors can complement each other in order to gain a holistic value for the alignment between business and IT.

3.4.1.2 Intangible Factors that Influence the Value of Business-Aligned IT

Recent studies have shown the impact of intangible factors – namely, the social values of relevant stakeholders associated with business and IT – on the business value of IT applications (Jambari, 2014, Liu et al., 2011, Hamidou Dia, 2010). Cultural aspects also

define the fundamental form of control for stakeholders involved in organisations (Sarros et al., 2005, O'Reilly et al., 1991). Both cultural and social aspects are relatively related and their definitions are often used interchangeably (Danesi and Perron, 1999). However, in the context of business and IT alignment, social aspects are derived from the cultural aspects of relevant people who have influence on the business and IT landscape within an organisation (Jambari, 2014). Despite the obvious influence of cultural aspects on the value of the business-aligned IT, it is difficult to articulate these aspects due to their subjective nature, and this could be one of the reasons why these aspects have always been dismissed as factors for measuring the value of business-aligned IT (Jambari, 2014).

In order to articulate these cultural aspects, previous studies on organisational behaviour have paid attention to formalising rational mechanisms that enable the assessment of business and IT values in an organisational operation (Liu et al., 2003). Cultural aspects become strong when they are developed and spread among stakeholders within the organisation. This strong unified behaviour among stakeholders is highly likely to affect the overall behaviour of the organisation and therefore affect and influence the values of business services and their alignment with IT services (Sarros et al., 2005).

Addressing the impact of social aspects as a critical part of the measurement to determine the success of Information Systems (IS) has been highlighted in previous IS studies. For instance, Delone and Mclean (2004) address users' satisfactions as an important dimension for evaluating successful IS implementation through two case examples. Martinsons et al. (1999) measure IS success from four different perspectives through a balanced scorecard approach. These perspectives include user orientation, internal processes, business value and future readiness. Torkzadeh and Doll (1999) developed a tool to measure the perceived impact of IT on the quality of stakeholders' work in the organisation. The study shows a positive relationship between the perceived impacts of IT on the quality of the work through four perspectives: productivity, customer satisfaction, innovation and management control.

A recent case study conducted by Binyamin et al. (2017) in a higher education institution in Saudi Arabia examined the impact of social influence, prior experience with learning management systems, students' satisfaction, teacher roles and computer self-efficacy on the use of learning management systems. All examined factors are found to positively influence students' use and acceptance of the learning management system. It is clearly indicated through previously mentioned work that intangible social aspects have a significant impact on the successful implementation of information systems. When both tangible and intangible factors are combined, they would have substantial impact on the value of the business-

aligned IT.

In this research and for the purpose of assessing the value of business and IT alignment, a set of tangible and intangible factors are used, which are found in the information systems literature to influence the business value of IT. They are summarised in Table 3.4.

Table 3.4: The set of tangible and intangible factors that influence the business value of IT (adapted from Sun et al., 2014)

Tangible/ intangible	Factor	Description
Tangible factors	Business service strategic value	This value plays a role in determining the level of importance of business services within an organisation setting according to the organisation's niche.
	Business service efficiency	The efficiency of a business service in terms of providing value while meeting time and resource constraints.
	IS service criticality	The criticality level of the IS capability that is required by a business service.
	Technical quality of IT application	The technical quality of an IT application that enables it to perform its capability as required by the business service it supports.
	Financial gains acquired from IT application usage	The financial gains accrued from the usage of IT, e.g. reduce number of employees to perform certain tasks due to capability of IT application to do it more efficiently.
	IT application usage	The usage pattern of an IT application in terms of usage frequency and number of users.
Intangible factors	Stakeholders' perceptions towards business services	The perceptions of stakeholders towards business service offerings, e.g. business service offerings meet stakeholders' expectations.
	Stakeholders' perceptions towards IT services	The perceptions of stakeholders towards the usability and usefulness of IT services to support business operations, e.g. the IT applications are easy to use.

Although these factors have been discussed in the information systems literature, there was doubt about their applicability to the higher education sector. This is due to the lack of comprehensive business and IT alignment assessment research within this sector. This led the researcher to develop a questionnaire (Appendix B) asking experts from Albaha University whether or not these factors can also be applied in the higher education context for the purpose of evaluating business and IT alignment. Four responses from IT/IS experts from Albaha University were returned with general consensus that these factors are also applicable to the higher education environment. Although the number of experts is small, it was sufficient to proceed with this list of factors to carry out the business and IT alignment assessment at a higher education institution.

For simplicity and readability, these factors are further discussed with measurement approaches within business analysis techniques in Chapter 5, and interpreted through data derived from the case study in Chapter 6.

3.5 Profiling of Business and IT Services

The principles discussed from Service-Oriented Architecture, Enterprise Architecture and Task Technology Fit support the description and the structuring of business operations and IT resources as independent services. This then enables the encapsulation and the organisation of relevant business and IT information into independent profiles. Profiling is practiced in many disciplines and, at its simplest, refers to the process of organising relevant information in a profile (Golemati et al., 2007). Unlike data structures, organising data in profiles is not restricted to any specific form of organisation (e.g. tables, arrays, or graphs). Relationships or constraints among different elements within one profile may also not be required, yet the elements must be of relevance to an overall subject or an entity.

In this research, profiling is applied as a technique to organise information about business and IT services forming independent business and IT service profiles. This facilitates the mapping between business and IT services and also allows for prompt access to important relevant information about these services at different stages of the alignment assessment. According to Goodhue and Thompson (1995), the articulation of the right knowledge from business operations and IT resources facilitates the right fit between them. These profiles, therefore, enrich the practical assessment of business-aligned IT. However, information within these profiles has to be updated either immediately or on an interval basis to provide useful and more recent information that supports continuous assessment of the business and IT alignment.

Forming the structure for the assessment of the fit between business operations and IT resources is supported by the principles of TTF. Particular attention has been paid to the degree of fit between business operation requirements and IT characteristics. TTF proposed that the performance of organisational operations is affected by how well an IT resource 'fits' with the business requirements. For assessing the value of the fitness itself, concepts from Social Exchange Theory are adopted as discussed next.

3.6 Social Exchange Theory for Evaluating the Value of Business and IT Alignment

Social Exchange Theory (SET) is adopted to represent the value of the fit between business operations and supporting IT resources at the organisational operation. The development of this theory was mainly to examine interpersonal exchanges that are not clearly related to economic aspects (Gottschalk and Solli-Sæther, 2005). Concepts from this theory, and its

mainly focus on the influence of social values, allow for the integration of tangible and intangible factors in a mechanism that assists for the evaluation of business and IT alignment at the operational level of an organisation.

In its main concept, social exchange holds that there is a general expectation of some future return when one actor does a favour for another, although the exact nature of the return is not necessarily stipulated in advance (Blau, 1964). This is what makes social exchange different from economic exchange, in that the former entails unspecified obligations, whereas the latter specifies the exact quantity to be exchanged based, for example, on a pre-specified contract. Emerson (1976) extends the view of the concept to go beyond its dyadic format to accommodate a large number of actors. In this sense, SET is described as the social exchange in a network that is established as a result of joining a set of actors who are involved in the social construct. This is relevant to the evaluation of business and IT alignment in that the value analysed from a number of stakeholders offers different perspectives for the value of the alignment. The engagement of stakeholders in the exchange relation is for the purpose of rewards (Emerson, 1976).

3.6.1 The Principles of SET in the Context of Business Operations-Aligned IT Resources

Stakeholders involved in organisational operations have expectations about IT capabilities and also expectations of what benefits can be obtained from these capabilities (Bostrom and Heinen, 1977). This highlights the social essence of IT implementations and usage for enabling business operations. It also emphasises the significance of social aspects as an important factor to impact the assessment of the value of IT as it is aligned to support business operations. The social exchange between business-aligned IT within an organisational operation is reflected in SET through the impact of the social aspects on the value of the business and IT alignment. The resulted value from the alignment assessment would then indicate the behaviour of the business operation aligned with its supporting IT resources. Based on the principles of SET, the value of the business and IT alignment is high when the perceptions of stakeholders towards this alignment are more positive (Blau, 1964).

Previous studies in social exchange have demonstrated the ability of stakeholders' interactions to enforce changes in the working behaviour of an organisational operation (Cook and Whitmeyer, 1992). Similarly, this can be applied in assessing the value of business and IT alignment where stakeholders' interactions denote the social aspects that influence the alignment and therefore can force changes to the value of this alignment. The

adoption of social exchange theory principles for assessing the value of the alignment aims to boost the business-aligned IT outcomes that have positive values and reduce those that have negative values (Molm and Cook, 1995). Positive values of business and IT alignment refer to business operations as being effectively aligned with IT resources with regards to supporting operational efficiency. Another relevant principle is the mutual dependency of business operations and IT resources, where both are developed with such that they reciprocally justify their existence in the organisation.

The focus on the social aspects that are drawn from the interactions of stakeholders implies the influence of their power as evaluators to determine the dependence structure of business and IT (Lawler and Thye, 1999). However, the power of stakeholders as evaluators varies significantly from one stakeholder to another based on the concept of the differentiation of power. That is, when a stakeholder's role in an organisation is of a higher importance, then the higher it would be the impact of his/her social values towards the value of the business and IT alignment. Thus, different stakeholders with different roles in an organisational operation are assigned different levels of power in correspondence to their level of significance. This reflects on the level of strength of various social values in assessing the value of business and IT alignment.

Many existing approaches for assessing IT related values have focused on adopting either tangible or intangible factors (Mitra et al., 2011). However, the adoption of SET principles has supported the integration of both tangible and intangible factors in the assessment of business-aligned IT value. More focus on the adoption of SET principles has been placed on the perspectives that predict the level of stakeholders' satisfaction as well as the durability of business and IT alignment at the operational level (Sprecher and Metts, 1999). The level of stakeholders' satisfaction is described as the ability of IT resources to fulfil their needs for enabling their tasks, whereas the durability of the alignment is described as maintaining or terminating IT resources that are valued as poorly aligned with business operations (Cropanzano and Mitchell, 2005).

In order to address these two perspectives, tangible and intangible factors are integrated to articulate business and IT related values. Although the integration of both tangible and intangible factors for carrying out the alignment assessment is complicated and has been claimed to produce incomprehensible outcomes (Cumps et al., 2009), deriving the value of business-aligned IT through the integration of these two types of factors provides a more comprehensive view and informed value of business and IT alignment, since it is derived through the analysis of multi-dimensional factors. The resultant value can then assist with

decision-making with a view to optimising IT capabilities and business operations in the organisational operation.

3.6.2 An Approach for Evaluating Business Operations-Aligned IT Resources through SET

Previous discussions highlight the importance of articulating social aspects as significant factors in assessing the value of business and IT alignment. Although main consideration in determining IT values in business operations is placed on quantitative values derived from tangible factors, the qualitative values derived from intangible factors can be supportive to the assessment in terms of providing a holistic value for business-aligned IT.

SET has been adopted in many previous studies to examine the relationships in the supply chain (Griffith et al., 2006); to analyse IT transformation in business where social and political dimensions are considered to complement other economic dimensions (Carr and Pearson, 1999, Johnston et al., 2004); to promote knowledge exchange among online community of practice (Tiwana and Bush, 2000); and to influence IT outsourcing (Whitten and Wakefield, 2006). More recently, Yan et al. (2016) adopt SET principles to demonstrate knowledge sharing behaviour in online health communities. Similarly, Huang et al. (2018) use SET to explain social networking behaviour in online gaming communities. Paraskevaidis and Andriotis (2017) adopt SET to investigate altruism in tourism from the perspective of host volunteers, with more insights on host volunteers' motivations being provided. Finally, Huang et al. (2016) implement SET to investigate the impact of employees' perceptions of the safety climate on job satisfaction, employee engagement and turnover. In this study, employees' perceptions from subjective and objective perspectives are explained through SET to go beyond accidents and injuries.

In this research, SET principles are used to address the inconsistency that results from articulating tangible and intangible factors as measuring criteria for the assessment of the value of business-aligned IT services. As a result, benefit values that are drawn from social aspects are incorporated in economic relationships with financial values (Whitten and Wakefield, 2006). Attitudes and behaviours through SET principles are then determined through the concept of '*rewards'* for the interaction between business and IT domains (Emerson, 1976). The *rewards* of the interactions reflect the integrated qualitative and quantitative values as benefit values derived from the interactions between business operations and IT resources (Sun et al., 2014). The cost of the interaction itself has not been considered in this research since IT resources are defined as small, modular and replaceable

components that cannot be easily financially estimated.

The higher the relative benefit value that results from multiple integrated qualitative and quantitative values, the more the business operations are aligned with supporting IT resources. Four aspects have been defined in SET as principles of social exchange that are relevant to attempts to evaluate business and IT alignment value (Blau, 1964, Cook and Whitmeyer, 1992). These aspects include:

- **Group formation and cohesion:** this aspect reflects the mapping of business operations and IT resources as the establishment of their alignment.
- **Integration:** this aspect is reflected through the evaluation of the state of business and IT alignment through the integration of several tangible and intangible factors.
- **Differentiation:** this aspect reflects the identification of different values from the assessment of the same IT resource that is aligned to support multiple business operations.
- **Dissolution:** this aspect reflects the elimination of IT resources based on their alignment value with business operations.

Values from the business and IT domains that are articulated through the social exchange assessment can further assist decisions for optimising business-aligned IT in the organisation's operational landscape. Approaches that take social aspects into consideration to form business and IT alignment are discussed next, which highlight the importance of articulating these aspects to establish this complex business and IT alignment relationship.

3.7 Approaches that Incorporate Social Aspects in Establishing Business and IT Alignment

The involvement of social aspects in an organisational operation has challenged efforts to establish proper alignment between business and IT. However, several approaches have been discussed in the IS literature which incorporate social aspects as important factors in establishing business and IT alignment. Two approaches are reviewed in the following sections to gain more understanding about the impact of social aspects on the formation of alignment between business and IT in organisations.

3.7.1 Soft Systems Methodology

Soft System Methodology (SSM) is a renowned methodology that emphasises the importance of treating Information Systems (IS) in organisations as a "*cultural rather than*

a technical phenomenon" (Checkland, 1999). As a consequence, it pays more attention to the roles and concerns of relevant stakeholders in the development of business and IT alignment at the operational level. SSM describes linkages between business operations and supporting IT resources based on different stakeholders' viewpoints (see Figure 3.15). These viewpoints consider the needs and views of multiple stakeholders towards fitting IT resources to enable business operations.

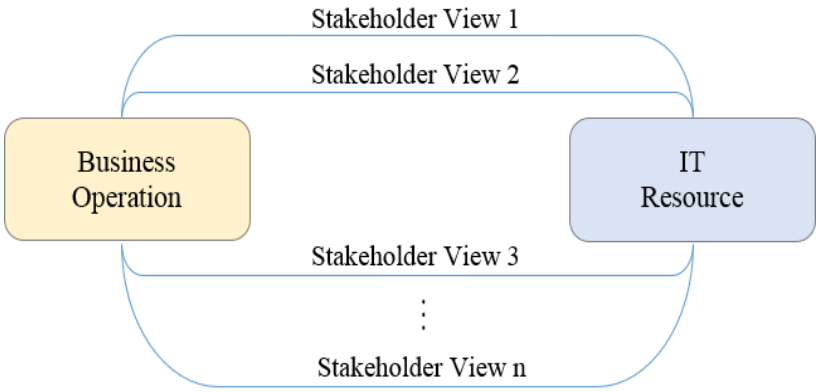

Figure 3.15: The relationship between business and IT from stakeholders' views based on SSM (Checkland, 1999)

There are six perspectives that have been highlighted in the SSM which focus on the management of IT resources from different related stakeholders' views that are significant in influencing the alignment (Checkland and Poulter, 2006). These perspectives are represented in the word (CATWOE) which stands for Clients, Actors, Transformation, Worldview, Ownership and Environmental constraints. The concepts provided by SSM to establish the alignment are generic and the lack of a specified description to guide the mapping between business operations and IT resources is the main challenge to its practicality for establishing the alignment. Nonetheless, it clearly highlights the influence of social stakeholders' views on forming business and IT alignment.

3.7.2 Cognitive Work Analysis

Cognitive Work Analysis (CWA) is a methodology that is developed to model complex socio-technical systems. It has been used for different purposes such as system design, system modelling, information requirements and specification, team design and interface design. However, the focus of CWA on defining constraints in a complex socio-technical system (Naikar et al., 2006) facilitates the identification of the restrictions in the linkages between business and IT at the operational level of organisations. As defined by Vicente (1999), CWA is a developmental methodology that consists of five different phases as

illustrated in Figure 3.16. These phases identify and analyse different perspectives of constraints on workers' behaviour in the organisation (Naikar et al., 2006). In the first phase, which is *domain analysis*, the capabilities of the system are defined to form the basis of the knowledge required about business and IT elements such as the behaviour of relevant stakeholders and physical resources. The activities involved in the system that are essential to successfully control it are then identified in the *control task analysis* phase (Lee and Kirlik, 2013).

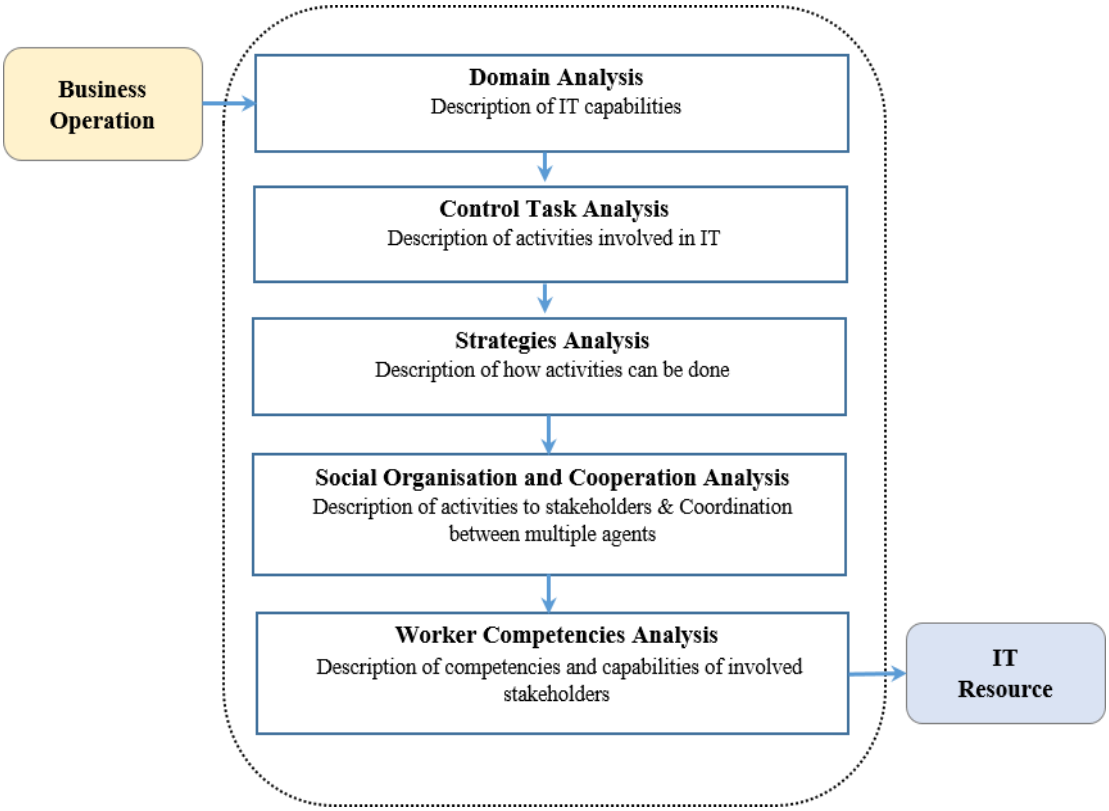

Figure 3.16: The phases of the Cognitive Work Analysis for aligning business operations and IT resources

This phase is coupled with the *strategies analysis* phase to provide the means of how the activities can be accomplished (Bisantz and Burns, 2008). In other words, *control task analysis* results in a description of what needs to be done, whereas the *strategies analysis* results in a description of how it can be done (Vicente, 1999). The fourth phase is the *social organisation and cooperation analysis*, which specifies how requirements can be disseminated across human actors and the automation. The last phase is the *worker competencies analysis*, where the competencies of relevant stakeholders are identified to determine their capabilities to effectively perform in the business and IT domains. The phases in CWA are divided to address different aspects involved in the organisation with more focus on technical and social aspects. This provides clear structuring and better

understanding of the business and IT domains in the organisation. The tangible aspects in the organisation such as the financial factors of IT resources and their influence towards the social aspects within the analysis phases have not been addressed in the CWA. There is also an absence of guidelines that can be followed to perform CWA (Naikar et al., 2006).

The discussion of these two approaches highlights the importance of including social aspects as an important element to form a proper alignment between business and IT. However, these approaches cannot be utilised to assess the level of alignment between business and IT. Therefore, an overview of practical approaches that have taken social aspects into account to assess the value of business and IT alignment are discussed in the following section.

3.8 Practical Approaches for Assessing Business and IT Alignment

Although many attempts have been made by researchers and practitioners to develop measurement tools to assess the alignment between business and IT, there is still no universal way to carry out this alignment assessment (De Haes and Van Grembergen, 2015). According to De Haes and Van Grembergen (2015), many researchers have tried to develop comprehensive measurement models that are as complete as possible to capture the complex alignment construct and, as a result, each model ended up having its own specific approach. This makes it challenging to compare findings of IT alignment studies. Relevant approaches are discussed in the following sections to provide insights on how business and IT alignment assessment is practically conducted.

3.8.1 The Matching and Moderation Approaches

The matching and moderation approaches are described in Venkatraman (1989) as interpretations of the concept of fit between business and IT. The matching approach is a simple straightforward methodology to measure alignment between business and IT, which highlights differences in ratings between two pairs of related items (i.e. business items and IT items) to indicate the level of alignment. Alignment, therefore, is the level of similarity between the ratings of these business and IT items. When there is a high level of similarity between related items, the alignment is high; on the other hand, when there is low level of similarity, there is a high level of misalignment (see Figure 3.17).

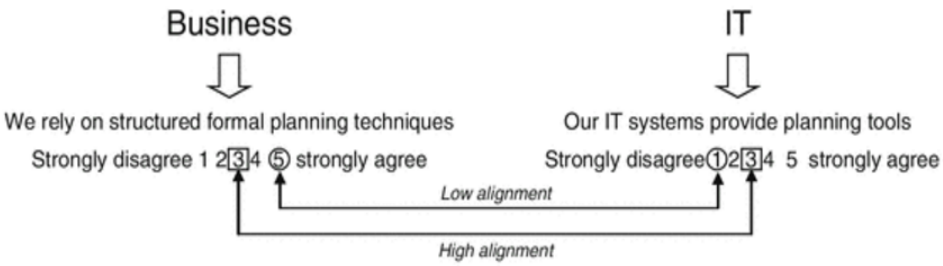

Figure 3.17: Representation of the matching approach for assessing business and IT alignment (De Haes and Van Grembergen, 2015)

The moderation approach, on the other hand, views the alignment as an interaction or, in other words, as a combination between business and IT items. In comparison with the matching approach, the moderation approach does not focus on calculating the differences between business and IT items, but rather focuses on the interaction between them towards the organisational performance (Hale and Cragg, 1996). In this situation, high ratings for both business and IT items would result in a high alignment score, whereas low ratings for both items would result in a low alignment score. Therefore, the outcomes of these two approaches can be different (De Haes and Van Grembergen, 2015).

Hoffman et al. (1992) examine the matching and moderation approaches in a model to investigate the impact of the organisational structure-technology fit on organisational performance. They pointed out that although results produced by these two approaches were in the same direction, the moderation approach was less ambiguous and provided more significant results. Cragg et al. (2002) similarly apply both approaches to measure the alignment at the strategic and operational levels in small organisations. Based on collected data from 250 respondents, they found that the moderation approach is more suitable for measuring business and IT alignment compared with the matching approach. They also found that small organisations with high levels of alignment tend to perform better than those who do not experience proper alignment between business and IT.

Although these approaches provide a straightforward way to measure business and IT alignment, they are mostly applied at the strategic level. They also provide only an overall value of the alignment but without conducting a detailed analysis of several tangible and intangible factors that influence this alignment value. Nonetheless, these approaches show through previous applications that the assignment of rating values for business and IT items is accomplished by individuals. This as a subjectively driven value illustrates the social influence on assessing the value of business and IT alignment.

3.8.2 The Business and IT Alignment Method

Chen et al. (2005a) introduce the Business and IT Alignment Method (BITAM) as a methodology that can assist in the evaluation of alignment between business and IT (see Figure 3.18). They claim that until the development of the BITAM, no efforts were undertaken to develop a method that can detect, gauge and ameliorate the impact of misalignment between business and IT strategies. They then introduced BITAM to manage, detect and correct this misalignment through a process that describes a set of twelve steps. These steps represent the guidelines for the procedures required to analyse the current state of business and IT alignment.

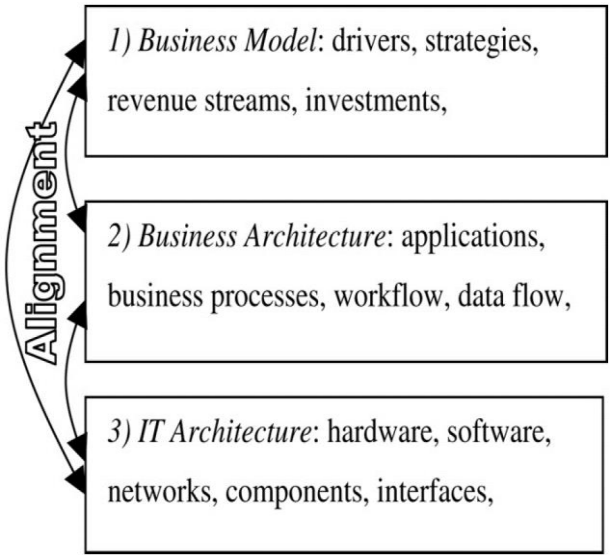

Figure 3.18: The Business and IT Alignment Method (BITAM) (Chen et al., 2005a)

First, sets of business driving forces, operational scenarios and change scenarios are elicited from relevant groups of stakeholders to initiate the process. Then, the operational and change scenarios are prioritised to allow key information and technical architects to carry out an elicitation of the business architecture. Once information is elicited from this step, the operational and change scenarios are mapped onto the business and IT architectures. These mappings are assessed for any misalignments and, once misalignments are identified, efforts for realignment are proposed for the business and IT strategies. The propositions are then evaluated to justify their financial impacts on the organisation.

The analysis steps defined in the BITAM address misalignment at the strategic and operational levels of an organisation. This illustrates the importance of having a comprehensive analysis at both levels in order to have better aligned business and IT. The twelve-step process in BITAM also highlights the intensive role of relevant stakeholders to provide valuable inputs for the analysis. However, regardless of their intensive involvement,

the impacts of intangible aspects as influential factors on the alignment analysis have not been specified.

3.8.3 The Method for Evaluating the Business Value of IT

In a recent study, Sun et al. (2014) develop a comprehensive method that takes into account social and technical aspects for evaluating alignment between business and IT. It aims to optimise the IT portfolio at the operational level of organisations to ensure that existing IT resources deliver business value. Building on fundamental information systems and IT alignment theories and methodologies such as Strategic Alignment Model (SAM), Enterprise Architecture (EA), and Service-Oriented Architecture (SOA), the method introduces a number of business analysis techniques that support the assessment of existing IT applications in relation to their abilities for maximising business value. The techniques are described in three stages of analysis as illustrated in Figure 3.19.

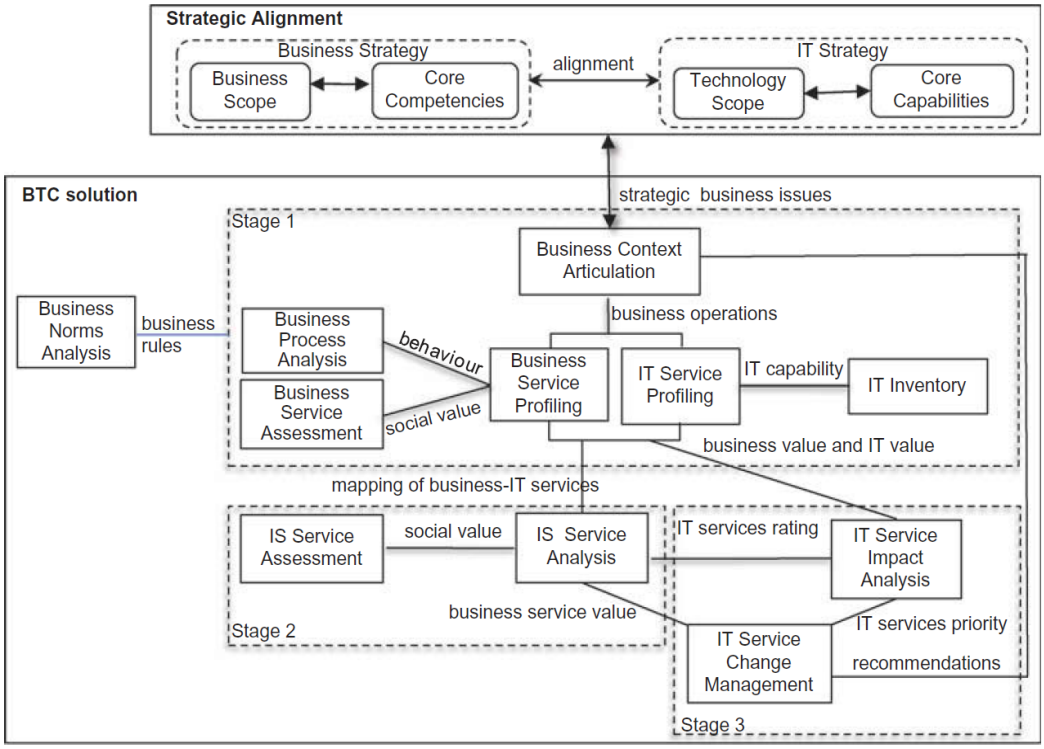

Figure 3.19: A method for evaluating business value of IT (Sun et al., 2014)

In the first stage, strategic issues such as reducing operational costs and enhancing business performance trigger the evaluation process at the operational level, which leads to further understanding and investigation of existing related business and IT capabilities. These capabilities are then independently profiled as business and IT services. A detailed description of the business and IT services supported by analysed social and technical perspectives is carried out in this stage. This then facilitates an alignment analysis to be

carried out in the second stage through IS services that are defined to map business services to corresponding IT services. Different groups of stakeholders are involved in this analysis to evaluate the benefits of IT to the business through multiple tangible and intangible factors. The outcomes of this analysis are then integrated, in the third stage, with business service values that are identified in the first stage to determine the business value of IT. A set of recommendations to IT applications that includes 'retain', 'replace', 'outsource', or 'remove', based on the intensive analysis of business and IT services throughout previous stages, is then drawn to optimise the business value of IT.

The method was practically applied in a public organisation in the UK and set to evaluate 75 IT applications deployed to support 28 business services. The evaluation of these business and IT capabilities was based on a strategic issue statement that is set by the organisation which aims to achieve cost-effectiveness in the organisational operation. Therefore, the analysis is conducted with more focus on expensive IT applications that are considered to not add adequate value to the business. The results from the application of this method indicate that possible savings of 28.05% from total IT expenses can be achieved once the recommendations are applied.

The method provides guidelines of theoretical and methodological principles as well as technical and social factors that should be considered in comprehensively evaluating business and IT alignment at the operational level of organisations. The structure of the method is also designed based on best practices in IT alignment and information systems theories and methodologies, which enables further incorporation of other factors and techniques to be embedded in the method without re-designing it. Finally, the emphasis on social perspectives as important factors that influence the value of the alignment is reflected in this method where different groups of stakeholders are engaged in different techniques to provide inputs that lead to comprehensively deriving the business value of IT.

However, the method does not take advantage of the comprehensive business and IT analysis when reporting back to the strategic level about the business performance of the organisation. Besides enhancing the IT portfolio through the method's outcomes, this bottom-up approach would also provide insights to enhance business aspects that would lead to better alignment between business and IT. Moreover, although the method provides a technique for evaluating the performance of business services from an intangible perspective through stakeholders' perceptions, it does not provide a concrete tangible approach that complements the intangible one, which may lead to biased results for determining the level of effectiveness of analysed services.

3.9 Critiques of Theoretical and Methodological Grounds for Assessing Business and IT Alignment

This section serves as the transition phase from the literature review (i.e. underpinning theoretical and methodological foundations) to a proposed service driven business and IT alignment assessment method, which is thoroughly introduced in Chapter 5. Although many practical approaches for evaluating the alignment between business and IT at the operational level have been developed and can be mostly found in consulting practices, they tend to be ad hoc, having specific approaches for assessment which makes it difficult to come to a universal methodological approach to be applied for assessing the alignment between business and IT (Ullah and Lai, 2013, De Haes and Van Grembergen, 2015).

The lack of a comprehensive approach that incorporates tangible economic and intangible social factors in the alignment assessment poses another challenge in the state-of-art business and IT alignment assessment (Sun et al., 2014). This leads to the exploitation of principles and concepts from previously discussed theoretical and methodological foundations to propose an assessment method for carrying out the business and IT alignment evaluation at the operational level of organisations. Table 3.5 provides critiques on chosen scientific work that is integrated into a novel approach to carry out the business and IT alignment assessment.

Table 3.5: An overview of chosen scientific work underpinning the proposed business and IT alignment assessment method

Theories and methodologies adopted	**The purpose of adoption**
Socio Technical Systems (STS)	Principles from this theory are found suitable to describe an organisational operation demonstrating social and technical aspects that influence the operation of an organisation. However, this creates ambiguity to elicit business service values and IT service values since social aspects are subjective in nature. This then leads to consider concepts of norms, which are defined in Organisational Semiotics.
Organisational Semiotics	Norms, as defined in Organisational Semiotics, are found appropriate to assist for articulating formal and informal rules that exist in the organisational operation (i.e. business and IT services). However, the outcomes from norms analysis cannot be quantitatively represented, which prevents its value from being incorporated as one of the influencing factors that affect the value of business and IT alignment. Having a mechanism to represent norm values in quantifiable terms would enrich the influence of intangible aspects on the value of business and IT alignment.
Strategic Alignment Model (SAM) (Henderson and Venkatraman, 1993)	The seminal well-known Strategic Alignment Model (SAM) proposed by Henderson and Venkatraman (1993) is found appropriate for providing guidelines to establish a proper alignment between business and IT. The structure of the proposed method is then influenced by the SAM, where business and IT alignment is

	described at both strategic and operational levels. However, SAM has never been used to measure the alignment between business operations and supporting IT resources.
The Unified Framework for business and IT alignment (Maes et al., 2000)	This extension work of SAM by Maes et al. (2000) in a Unified Framework for business and IT alignment is found appropriate for providing guidelines to establish the alignment between business operations and supporting IT resources, but with more emphasis on the importance of articulating social perspectives of related stakeholders at the operational level. It also supports establishing effective communication layers between strategic and operational levels, which is interpreted in the proposed method through Key Performance Indicator (KPI) concepts to link and guide the assessment at the operational level towards achieving strategic objectives. Nevertheless, the Unified Framework in itself, cannot be used to measure the alignment between business and IT at the operational level.
Service-Oriented Architecture (SOA)	Since current business and IT alignment research is focusing more on the concept of service orientation as a new paradigm shift in business thinking, the proposed solution is also designed to be service-driven. Therefore, principles from Service-Oriented Architecture (SOA) are found suitable for enabling a clear description of business operations and IT resources as independent business services and IT services, respectively. Business and IT services are then described at the same granularity level to facilitate the logic for establishing their alignment and assessment. This is due to the complexity of the operational level and the possibility of describing these services at different granularity levels.
Enterprise Architecture (EA)	Principles from Enterprise Architecture (EA) are found suitable for enabling individual structuring and management of these business and IT independent services. EA frameworks such as Zachman and The Open Group Architecture Framework (TOGAF) provide an effective approach for observing the detailed relationship between business and IT activities. TOGAF in particular specifies a process for managing articulated information of business and IT aspects in the organisation. However, since these approaches do not provide a mechanism to establish the alignment between business and IT services, concepts from Task Technology Fit (TTF) theory are adopted.
Task Technology Fit (TTF)	The concepts from TTF theory are found suitable for establishing the links between business tasks and technology capabilities through fit interpretation of the relationships between them. TTF is also found appropriate for its focus on the social perspective in establishing the relationship between business and IT services. This supports the incorporation of intangible factors such as the perceptions of human actors towards the evaluation of the performance of business and IT services. However, TTF does not define an approach to determine the degree of fit between business and IT services. This leads to the adoption of principles from Social Exchange Theory (SET) to realise the degree of fit between business and IT services, which reflects the value of the business and IT alignment.
Social Exchange Theory (SET)	Principles from SET support the incorporation of tangible and intangible factors in determining the value of the business and IT interaction. SET does not specify the set of factors that have to be involved to determine this value. This is then found applicable in

	determining the value of business and IT alignment through a proper integration of tangible and intangible factors that are found to influence this alignment's value. However, tangible and intangible factors are represented in different data types and the principles of SET are not capable of handling these multi-data forms. This leads to the normalisation of the resulted values from different factors into a standardised value to enable stability of the factors' values during the assessment of the business and IT alignment.
Soft System Methodology (SSM), Cognitive Work Analysis (CWA), the matching and moderation approaches, the Business and IT Alignment Method (BITAM) and the evaluation method proposed by Sun et al. (2014)	Both theoretical and practical business and IT alignment approaches that have been discussed in previous sections including Soft System Methodology (SSM), Cognitive Work Analysis (CWA), the matching and moderation approaches, the Business and IT Alignment Method (BITAM) and the evaluation method proposed by Sun et al. (2014) have shown the influence and importance of articulating social perspectives in the assessment of business and IT alignment due to their significant impact on the level of alignment between business and IT. The last two approaches, specifically, illustrate the necessity of having a comprehensive approach to address the complexity of business and IT alignment assessment at the operational level of organisations.

The integration of these principles and concepts from multiple theories and methodologies into a new approach to evaluate business and IT alignment reflects the complexity and the multiple perspectives that are involved in the evaluation process of business and IT alignment at the operational level of an organisation. De Haes and Van Grembergen (2015) emphasise that researchers, in their studies, should adopt the most suitable approach for their business and IT alignment research. The proposed method has been influenced by previously mentioned theoretical and practical grounds and mostly by the efforts made by Sun et al. (2014), which comprehensively address the business and IT alignment at the operational level, while also taking both tangible and intangible aspects that influence this alignment into consideration.

However, the proposed approach provides more analytical capabilities by drilling down to business processes and IT components to elicit more concrete facts to be used towards measuring the alignment value. The proposed method also links the strategic level of the organisation with the operational through KPIs that are mapped to business services for two purposes: first, to guide the alignment evaluation process at the operational level to be focused on a set of business services that are critical to the organisation. This means that efforts spent on the analysis of business-aligned IT services are devoted to services that affect an organisation's success, since they are linked with strategic KPIs. Second, to enable a feedback mechanism on the operational performance to be delivered at the strategic level once the alignment evaluation cycle is completed. This provides another real-time dimension to observe operational performance and start accountability. This will also help to establish

a clear view of the aspects that are contributing to the violation of KPIs. The method is extensively introduced in Chapter 5 and then applied in a real-life case study in Chapter 6.

3.10 Summary

Evaluating business and IT alignment at the operational level of an organisation from only tangible or intangible angles may not lead to confidence in the evaluation outcomes. This has been learned from existing state-of-art research that seeks more comprehensive approaches for evaluating business-aligned IT. This chapter then provides a set of tangible and intangible factors that are found to affect this alignment, thereby, fully answering the first research question and building on the discussion made in the previous chapter. This chapter also paves the way to answer the second research question through the discussion of underpinning theoretical and methodological principles that provide guidelines and insights for devising a new approach that can facilitate the assessment of business and IT alignment at the operational level of an organisation.

The set of underpinning theoretical and methodological foundations that have been discussed in this chapter illustrate how business and IT alignment can be theoretically established and analysed, and how it can also be practically assessed. These foundations are then adopted and adapted to establish a clearly defined and managed alignment, which would subsequently facilitate the assessment of the state of this alignment. This is supported by principles and concepts from Service-Oriented Architecture (SOA) and Enterprise Architecture (EA) where an organisational operation can be made structurally clear, facilitating proper alignment on the same ground between business and IT services. However, the involvement of social aspects that influence this alignment creates further alignment assessment complexity. Task Technology Fit (TTF) theory is then adopted to establish the fit between business operations and supporting IT resources while taking social aspects into account. Finally, Social Exchange Theory (SET) is found suitable to integrate tangible and intangible factors to determine the degree of the fit between business operations and IT resources. Table 3.5, at the end of this chapter, points out the purpose of adopting and adapting these grounds to underpin the new proposed alignment evaluation method.

In order to scientifically incorporate these theoretical and methodological foundations and also the identified set of business and IT alignment influencing factors into an alignment assessment tool, research methodologies related to the information systems research are discussed in the next chapter. This leads to the selection of the most appropriate research approach that guides the development of the alignment assessment method.

Chapter 4
Research Methodology

The three research questions posed in this thesis are framed to develop a method that can facilitate the evaluation of business-aligned IT services at the operational level of an organisation. The development of this method to address real-world problems requires an appropriate scientific approach to be followed. The entire research thus has to be grounded in an appropriate set of paradigm, methods and techniques to ensure its scientific validity. This chapter broadly discusses different research paradigms, methodologies and techniques related to Information Systems (IS) in order to provide awareness of methodological options. It then discusses the approaches that are selected as most appropriate for achieving the research aim and objectives.

4.1 Review of Research Paradigms and Philosophical Groundings

Research methods are usually driven by philosophical stances that define the research paradigm. A research paradigm is defined as a set of beliefs that guides actions (Guba, 1990). In other words, it is a means of viewing the world that influences, yet does not control, the assumptions of the research (Kuhn, 2012). According to Lincoln and Guba (1985), three questions can be identified to determine the boundaries of a paradigm: ontology, epistemology and methodology. Ontology defines the study of being, where the nature of reality is described in terms of what is real and what is not, what is fundamental and what is derivative (Vaishnavi and Kuechler, 2015). Epistemology is defined as the theory of knowledge, where the nature of knowledge is explored with regards to its scope, methods, validity, and the distinction between opinions and justified beliefs (Orlikowski and Baroudi, 1991). Hirschheim et al. (1995) briefly describe ontology as what is assumed to exist, and the epistemology as how we can know about the things that are assumed to exist. The methodological question refers to the practical actions that one employs to gain knowledge or discover reality.

The answers to these three questions show a clear interrelated connection between them. That is, ontology presents the view of the world in either a subjective or objective manner, which effects the epistemology (the knowledge) of reality. Both ontology and epistemology provide guidance and directions to the methodology selection that is followed to gain

knowledge of reality. Different research paradigms that are discussed within the IS research are discussed next, with emphasis placed on Design Science Research as a research paradigm of choice.

4.1.1 Positivist Research Paradigm

Positivist research follows the method of natural science which assumes the existence of independent, stable and objective reality. This paradigm of research aims to increase predictive understanding of phenomena (Orlikowski and Baroudi, 1991). In this context, only observable phenomena that are considered to be real are recognised. Positivist research does not support subjective views from people that influence social reality. However, the emergence of the post-positivism paradigm helps to tackle this issue, where the study of the social world from people involved in real activities is supported (Hirschheim and Klein, 1994). On the other hand, anti-positivist research accepts the notion that the research could be biased due to researcher influences.

4.1.2 Interpretive Research Paradigm

Unlike the positivist paradigm, realities in this research paradigm are believed to be multiple and constructed. It assumes that access to reality can be gained through social constructions such as languages and shared meanings (Walsham, 1995). In the IS field, interpretive research has become more important with increasing numbers of published interpretive studies (Walsham, 2006). Adopting this paradigm in research provides the researcher with in-depth understanding of the studied phenomena (Orlikowski and Baroudi, 1991). Hence, this paradigm is more concerned with understanding what things actually are, not how things work. However, this research paradigm has been criticised for its subjective nature as researchers' assumptions, values and beliefs might shape the research study and its outcomes.

4.1.3 Design Science Research Paradigm

Design Science Research (DSR) has received growing consideration in the information systems literature (Fischer et al., 2010), following the influential work of Walls et al. (1992), March and Smith (1995) and Hevner et al. (2004). Hevner et al. (2004) state that the majority of the research in the IS discipline can be categorised into two main paradigms: behavioural science and design science. Unlike the behavioural science paradigm that seeks to develop and verify theories to explain or predict human or organisation behaviour, the design science

paradigm extends human and organisational boundaries to create new and innovative artefacts. Both the design and behavioural sciences complement each other to address essential problems facing the implementation of information technology (see Figure 4.1).

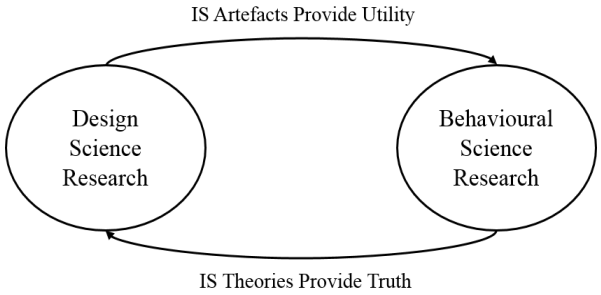

Figure 4.1: Behavioural science and design science research complementing each other (Hevner and Chatterjee, 2010).

Artefacts that are developed based on the DSR are created and evaluated with an intention to solve identified problems. March and Smith (1995) state that resulted artefacts can be broadly defined as constructs, models, methods and instantiations, which enable researchers, as well as practitioners, to realise and tackle organisational problems that are inherent in developing and successfully implementing information systems. Vaishnavi and Kuechler (2015) consider also frameworks, architectures, design principles and design theories as potential outputs of a DSR project (see Table 4.1).

Table 4.1: Possible outputs of a Design Science Research project (Vaishnavi and Kuechler, 2015)

Output	**Description**
Constructs	The conceptual vocabulary of a problem/solution domain.
Models	A set of statements or propositions conveying relationships among constructs.
Methods	Sets of steps used to perform a task.
Instantiations	Situated implementations in certain contexts that do or do not operationalise constructs, methods, models and other abstract artefacts.
Frameworks	Conceptual or real guides serving as support or guide.
Architectures	High-level structures of systems.
Design principles	Core concepts and principles to guide design.
Design theories	A perspective set of statements on how to do something to achieve a certain goal. A theory typically includes other abstract artefacts such as methods, models, constructs, architectures, frameworks and design principles.

The output of a DSR therefore should contribute to the design science knowledge. This knowledge contribution can be in different forms as illustrated in Figure 4.2. This framework shows four types of knowledge contribution that can be made through conducting research that follows a design science approach. One or more types of contributions can appear within a single piece of research, including: *invention,* which refers to inventing new knowledge/solutions for new problems; *improvement,* which refers to the development of new knowledge/solutions for a known problem; *adaptation,* which refers to innovative or substantial adaptation of knowledge/solutions for new problems; and, finally, *routine design,*

which refers to the application of known knowledge/solutions to known problems (Vaishnavi and Kuechler, 2015).

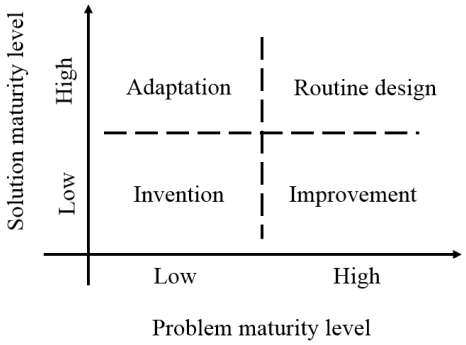

Figure 4.2: Contribution framework of a DSR (Gregor and Hevner, 2013)

Figure 4.3 illustrates the design science research framework and its fundamental concepts. These concepts are essential in the nature of the information systems research. They include the Environment, IS Research and the Knowledge Base. The environment is where the problems of interest take place involving people, technology and organisations. This is known as the problem space, which must be clearly represented for every problem-solving effort (Simon, 1996). The second concept is IS Research, which stands as a vehicle to address the issues and problems in the environment. Finally, the Knowledge Base, which consists of foundations and methodologies that represent raw materials from and through which IS research is achieved (Hevner et al., 2004).

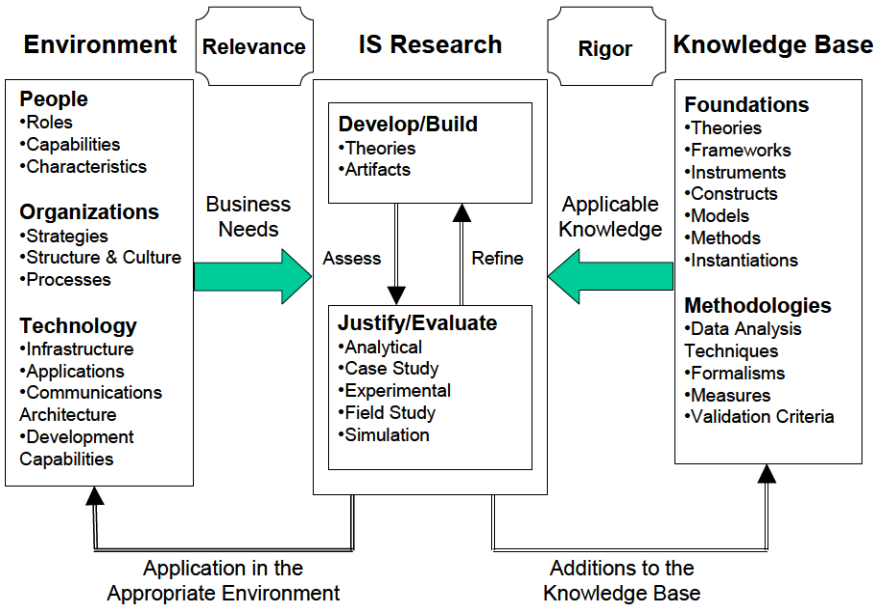

Figure 4.3: Conceptual framework for DSR (Hevner et al., 2004)

Based on the DSR conceptual framework proposed by Hevner et al. (2004), the design cycle can be adapted as a procedural flow for carrying out information systems research, where

the process steps guide the flow of knowledge throughout the design science research (Purao, 2002). This procedural flow is described in Vaishnavi and Kuechler (2015) as shown in Figure 4.4.

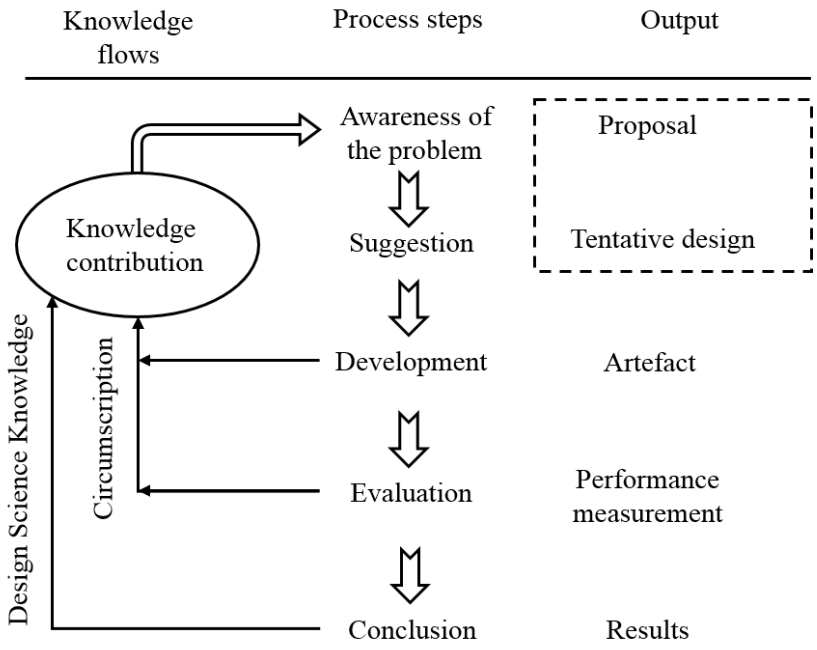

Figure 4.4: The process model for Design Science Research (Vaishnavi and Kuechler, 2015)

Based on this process model, the research begins with the *awareness of the problem* to identify the problem or gap in the real world. Then a preliminary *suggestion* design is made, derived from existing relevant knowledge and theory as a foundation to drive the research to solve the identified problem. The *development* of a tentative design resulted from the preliminary suggestion is then carried out to derive the solution (artefact). The developed artefact is then implemented and *evaluated* to determine its utilisation as a suitable solution to the problem identified. S*uggestion*, *development* and *evaluation* are iteratively performed in the course of the research effort. The iteration process represented in the flow from partial completion of the cycle back to awareness of the problem is reflected by the *circumscription* arrow. The *conclusion* then indicates the end of the research cycle. The *knowledge contribution* resulted from the knowledge production is indicated by the *circumscription* and *design science knowledge* arrows as shown in Figure 4.4.

The iterative feature of design science research provides the agility that allows the researcher to enhance and improve the artefact to reach the right solution for the right problem. The iteration is applied when the outcomes from the development and evaluation steps reveal further or different issues and problems from the ones that were initially defined in the first step. On the other hand, the complexity of conventional scientific research paradigms, such

as positivist and interpretive research paradigms, may not properly fit to solve real-world problems that are related to information systems research. This has influenced the emergence of DSR as an alternative perspective to address problem-solving in information systems research.

The differences between research paradigms are based on their descriptions of ontology, epistemology and methodology. Three research paradigms are discussed in this chapter, which are summarised in Table 4.2.

Table 4.2: Comparison between philosophical stances of three research paradigms (Vaishnavi and Kuechler, 2015)

Stance	Positivism	Interpretivism	DSR
Ontological	A single reality, knowable, probabilistic	Multiple realities, socially constructed	Multiple, socio-technologically enabled
Epistemological	Objectivist, dispassionate, dualist, detached observer of truth	Subjectivist, i.e. knowledge and values emerge from the researcher interaction	Knowing through making, Iterative circumscription reveals meaning, improve the world through intervention
Methodological	Quantitative (statistical)	Qualitative (hermeneutical, dialectical)	Qualitative exploration, quantitative confirmations
The purpose	Truth, universal and prediction	Understanding, situated and description	Control, understanding, creation, progress (i.e. improvement)

The establishment of an appropriate research paradigm for conducting scientific research is essential as it sets the philosophical assumptions of the research. This will then allow the researcher to properly determine applicable choices of research methodology, methods and techniques for the research.

4.2 An Overview of Research Methodology, Methods and Techniques

Although the terms methodology and method are fundamentally different, they are often interchangeably used. The following section clarifies the differences and the relationships between these terms and provides an overview of research methodology, methods and techniques that are applicable for information systems research.

4.2.1 Differences between Methodology, Methods and Techniques

A research methodology is defined as the theoretical perspective of the research, which includes the overall nature of the research activity to carry out a scientific investigation (Kothari, 2004). It describes the angle from which the researcher wishes to address the research problem or question (de Hoog, 1998). There are two fundamental methodologies: qualitative and quantitative. However, some research might not fit entirely into either of

these two research methodologies (Johnson and Turner, 2003). Therefore, a mixed methodology approach that combines principles from these two methodologies is applicable for guiding the investigation of this type of research.

On the other hand, a research method is described as the overall strategy or approach that a researcher engages in to carry out an empirical investigation. Specific methods can be adopted in information systems research to set the investigation structure, including action research, grounded theory, case studies and ethnography (Myers and Avison, 1997). Appropriate selection of a research method enables proper data collection processes to be performed. This will then lead to the production of results that fit the goal of the research.

For each research method, several data collection techniques can be applied. This does not necessarily mean an individual method is linked with a specific data collection technique (Williamson, 2002). A technique is the approach taken by the researcher to collect data or, in other words, it is a way of harvesting empirical evidences from the source. Figure 4.5 illustrates a research framework for conducting research studies which highlights the relationships between research paradigms, methodologies, methods and techniques.

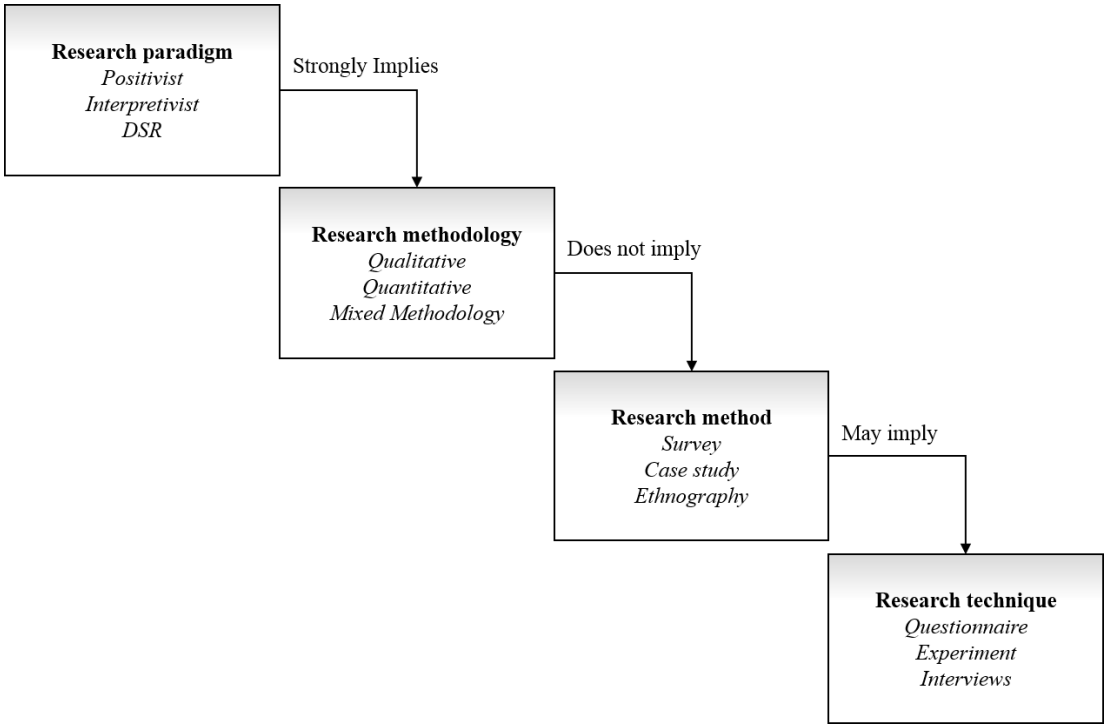

Figure 4.5: The research framework for conducting research studies (adapted from PICKARD, 2002)

Although choices of lower levels may seem to be influenced by those of upper ones, there are no strict correlations between them. Next, an overview of main research methodologies is introduced.

4.2.2 Research Methodologies

As indicated in Figure 4.5, a research paradigm defines a research methodology, where the latter sets the angle for the researcher to address the research problem. Two fundamental and one derivative research methodologies are discussed in the following sections.

4.2.2.1 Quantitative Research Methodology

Quantitative research is based on the assumption that human behaviour can be described by social facts, which can be interpreted by methodologies that use the deductive logic of natural sciences (Bryman and Cramer, 1994). It supports the measurement and analysis of causal relationships between variables in mathematical expressions. Studies that involve laboratory experiments, survey methods and numerical methods, such as mathematical modelling, are where this methodology is commonly adopted. However, there is an increasing tendency towards the application of qualitative research in information systems research, with the focus shifting from technological issues to users and organisational issues (Ousmanou, 2007).

4.2.2.2 Qualitative Research Methodology

Qualitative research was initially developed to enable researchers to study social and cultural phenomena related to social sciences. It refers to studies that are not empirically examined or measured through frequency, intensity or amount (Denzin and Lincoln, 2011). Although quantification is not the main emphasis of this methodology, it does not necessarily mean that it cannot use numerical values for its analysis (Easterby-Smith et al., 2012). However, Kaplan and Maxwell (2005) argue that the objectives of qualitative research revolve around the understanding of phenomena from participants' points of view and its particular social-institutional context is largely lost when textual data is quantified and aggregated.

Adopting this methodology in information systems research can benefit researchers to gain richer understanding of users' perceptions towards their use of technologies. This is due to the close interpretation of phenomena through the analysis of meanings from participants' perspectives in their natural environment (Kaplan and Maxwell, 2005). In fact, qualitative researchers need not only to understand the social context from involved participants, but also to understand their own perspective and its impacts on the selected method (Easterby-Smith et al., 2012). Action research, case studies and ethnography are some examples of qualitative methods, while questionnaires, observations and interviews are some examples of qualitative investigation techniques.

4.2.2.3 Mixed Methodology

A mixed methodology involves both quantitative and qualitative approaches (Tashakkori and Teddlie, 1998). It is typically adopted when the nature of the research does not fully conform to either approach (Johnson and Turner, 2003). Therefore, mixed methodology can be customised by combining relevant principles and concepts from qualitative and quantitative approaches into a single research methodology that fits the research intention (Leahey, 2007).

In terms of evidence, both qualitative and quantitative research methodologies are different in that the former provide soft evidence and deal with information patterns, while the latter provide facts that are predictable and unquestionable (Ousmanou, 2007). Nonetheless, they could complement each other when combined in a mixed methodology approach that is purposefully customised to meet a research goal.

4.2.3 Research Inquiry Methods for Information Systems Research

The selection of a research method will significantly influence the way in which the data is collected by the researcher. Case studies, action research, ethnography and grounded theory are some specific methods adopted in information systems research to underlie the investigation structure (Myers and Avison, 1997). These methods are briefly discussed below.

4.2.3.1 Case Studies

'Case study' refers to a qualitative approach taken by a researcher to investigate real-world phenomena in depth. Yin (2013, p.16) defines case study in one of the most applied and commonly accepted definitions as "*an empirical inquiry that investigates a contemporary phenomenon (the case) in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident*". It can represent both the process of investigation of phenomena as well as the written outcome of that investigation. It can also be used for both quantitative and qualitative research depending on what phenomena are being investigated and also what approach the researcher is adopting to acquire knowledge.

Multiple techniques can be employed in a case study, such as interviews, field studies and participant-observations, all of which enable researchers to collect information from individuals or groups and to develop appropriate solutions based on the analysis of the information gathered. Case studies are found to be more relevant for research that involves

social phenomena and an extensive and in-depth description is required (Yin, 2013). In the information systems discipline, case studies are the most commonly used qualitative method that provides a holistic view and in-depth knowledge of the phenomena (Orlikowski and Baroudi, 1991, Benbasat et al., 1987, Galliers, 1990). However, it is not intended for the production of generalizable findings (Galliers, 1990), but, rather, allows for the transferability of these findings to different applicable contexts (Maykut and Morehouse, 1994).

According to Stake (1994), there are three types of case study research in information systems: the intrinsic, the instrumental and the collective case study. The intrinsic case study is typically carried out to provide an in-depth understanding of phenomena in a natural setting, while the instrumental case study is used to explore a particular theory or phenomenon through the case, which acts as a vehicle for the investigation. The collective case study is used to describe a research study that involves studying new and rapidly changing situations through the use of more than one case to investigate the complex phenomenon.

4.2.3.2 Action Research

Action research is a practice based research that is usually conducted by practitioners who regard themselves as researchers (McNiff and Whitehead, 2009). It seeks to bring together theory and practice, action and reflection (Reason and Bradbury, 2001). In addition, it claims that for a difference to be made, actions or changes need to be incorporated in the research design from the beginning (McNiff and Whitehead, 2009). Actions that result from investigations into the action research approach need then to be evaluated.

Amongst practitioners, this approach is popular due to its ability to broaden experience in the wider community. Unlike traditional approaches, where theories and findings are presented in the form of recommendations for future actions, research and action in action research are carried out in parallel. In information systems research, the adoption of action research has become a widely accepted method for narrowing the gaps between researchers and practitioners. It is relevant since it sets a platform that allows researchers to experience the practical community through the research-practitioners relationship in the research process (Baskerville, 1999). Focus groups, observations, interviews and questionnaires are some examples of data collection techniques that are used in this research method.

4.2.3.3 Ethnography

Ethnography research aims to describe a holistic view of a social setting in an organisation through a combination of views of that of an insider and that of an outsider. It positions the researcher at the research site for a long time to obtain deep understanding of the social constructs within the organisation (Myers and Avison, 1997). Thus, it is considered one of the most in-depth research methods possible. Similar to the main concept of case studies, ethnography refers to the process of engagement as well as to the output of that engagement (Agar, 1996).

Ethnographic research has been widely used in information systems research, particularly in studies that are concerned with information systems development (Orlikowski, 1993, Hughes et al., 1992). Accordingly, it can enable researchers to understand stakeholders' needs in an organisation as well as different viewpoints and goals. This would eventually help in designing optimal applications that meet organisational and stakeholders' needs. Participants' observations are a primary data collection technique in ethnographic research.

4.2.3.4 Grounded Theory

Grounded theory is a systematic approach that aims to discover theory based on an inductive analysis of contextual data (Glaser and Strauss, 2009, Leedy and Ormrod, 2005). It promotes researchers to create theories that provide understanding of social phenomena. It is mainly a qualitative method based on its nature of articulating specific social phenomena. However, Glaser and Strauss (1967) state that it is also applicable for quantitative research. In addition, this method can be applied in ethnography, action research and case studies due to its simultaneous use of data collection and analysis (Charmaz, 2006).

The specific approach of theory development embraced in this method is what makes it different from other methods. It is not grounded on other theories as knowledge foundations to base the research design. However, all possibilities of developing a theory have to be examined as a result of analysing the collected data from the understanding of the social phenomena. Grounded theory becomes an increasingly common approach in information systems research due to its usefulness in the development of process-oriented, context-based explanations and descriptions of the social phenomena in the information systems (Orlikowski, 1993). Common techniques used in this method are group feedback analysis and face-to-face interviews.

4.2.4 Data Collection Techniques

Data collection techniques are not necessarily associated with specific research methods that are discussed in the previous section. However, understanding different available data collection techniques is important to help the researcher to decide on the most applicable options for achieving the research aim. Multiple data collection techniques that could be used for collecting empirical data are reviewed in the following sections.

4.2.4.1 Interviews

Interviews are one of the most adopted data collection techniques for case study research (Yin, 2013). The main purpose of interviewing participants is to have access to what is in their mind (Stenhouse, 1984). According to Guba and Lincoln (1989), an interview can take different forms, from highly structured administrated questions to highly open purposeful dialogue. Semi-structured interviews, for example, can be the best option when there are no chances of meeting someone again (Russel Bernard, 1988). In addition, interviews are more suitable when the researcher aims to acquire individual beliefs, feelings and views about a subject, especially when questions cannot be asked in a straightforward manner and more comprehensive answers are required.

Interviewees during interviews can experience more flexibility because they are usually allowed to respond to questions on their own terms and ask for clarifications for questions that are not clear or require further explanation (Bertrand and Hughes, 2005). Interviews can also be used to prove or disprove data collected from other data collection techniques such as observation and diaries. Rich and detailed data are usually the outcome from interviews, which sometimes can be very complex to analyse.

4.2.4.2 Questionnaires

Questionnaires are the single most commonly used data collection technique in research that involves human subjects (Pickard, 2012). When collecting data through questionnaires, researchers can harvest from larger sample than any other possible technique. However, low response rates and complex questions that might be misinterpreted by participants are some negative aspects of using this tool (Foddy, 1994).

The issue of low rate of responses can be overcome by personal administration of questionnaires when conducted, while questions that are too complex can be avoided by formulating briefer and more understandable questions. Thus, the questionnaire should be designed as a comprehensive tool, with logical, clear and concise questions (Oppenheim,

2000). Those questions can be either open-ended or closed. The former do not provide any indications or restrictions of possible answers, while the latter allow respondents to choose from two or more possible options.

4.2.4.3 Observation

Observation needs to be clearly designed and implemented just as many other data collection instruments. Its value stands in allowing researchers to study people in their natural setting to understand "things" from their perspectives (Baker, 2006). The researcher who adopts observation as a data collection technique is required to spend a significant amount of time in the field in order to comprehensively understand the people being studied. There is also a possibility for the researcher to play a number of different roles and to use a number of different techniques to collect data, which makes it a complex data collection technique (Baker, 2006).

Unlike other data collection techniques, a researcher who is adopting this tool may have an impact on the participants in the issue being studied. In this sense, he/she must remain detached enough to gather and analyse data relevant to the phenomenon under study (Baker, 2006). Adler and Adler (1987) state that during the observation process the researcher is in fact utilising his/her senses to collect information about the phenomena under investigation. However, according to Polit and Beck (2004), logs and field notes are the most common methods used for recording unstructured observational data.

4.3 Research Approach Adopted in this Thesis

The adopted research paradigm, methodology and data collection techniques in this research are discussed in the following sections. The source of data that is used in this research is also discussed along with an overview of the undertaken approach to validate the proposed business-aligned IT assessment method.

4.3.1 Adopted Research Paradigm and Methodology

The Design Science Research (DSR) paradigm is adopted in this research as the philosophical stance that is found applicable for the problem-solving nature of this research. The investigation in this research is established by being aware of a real-world problem. After the problem is clearly defined, efforts are then dedicated to finding a suitable solution that is backed by theoretical and methodological foundations, and then evaluated through a case study for its applicability to the problem at hand.

The research framework presented in Figure 4.6 is developed following the principles of DSR that are defined by Hevner et al. (2004) and the research activities that are described by Vaishnavi and Kuechler (2015) in Figure 4.4.

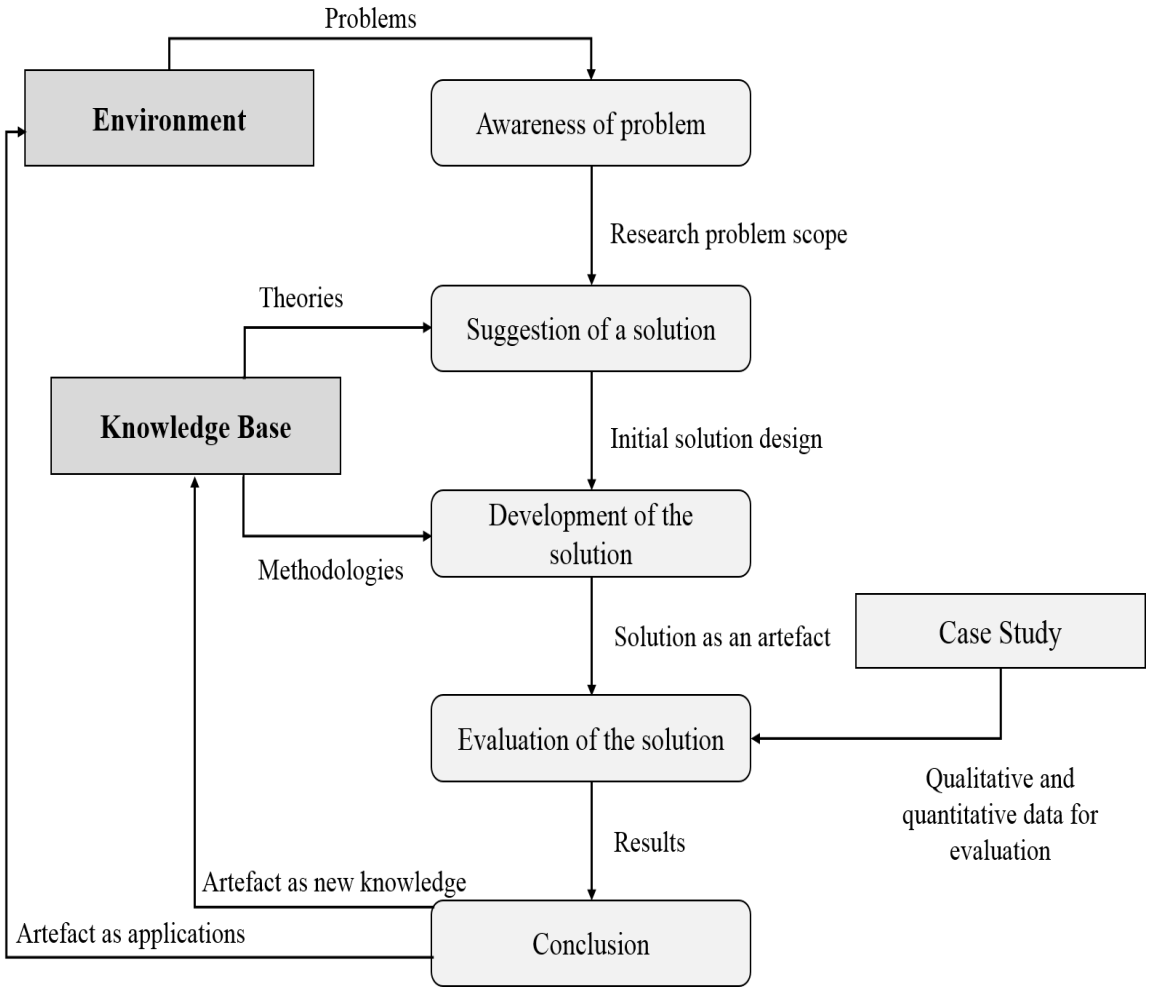

Figure 4.6: The research framework based on the Design Science Research paradigm

In this framework, five main research activities are defined to guide the research process to achieve its objectives:

- The first research activity, which initiates the research process, is awareness of the problem in the *environment* and its relevance to the state-of-the-art in the *knowledge base*. The identified research problem revolves around different components that include people, an organisation (i.e. Albaha University) and technologies, and the interactions between them from an alignment perspective. Being aware of stakeholders' poor perceptions towards the value added by IT systems at Albaha university is further supported by a lack of an integrated method, in the knowledge base, which can assist for evaluating the fit of these systems to support related business services. Hevner et al. (2004) state that IS problems that are characterised

by complex interactions among subcomponents of the problem and its solution are one type of IS problems that DSR addresses. Evaluating business and IT alignment at an operational level of an organisation considering a set of tangible and intangible factors that affect this alignment - through an integrated method - is then resulted as a research problem from the first research activity. This then guides the second research activity for suggesting a proper solution design to address the problem.

- In the second research activity, the solution design is set to develop an integrated method that can facilitate the evaluation of business and IT alignment at an operational level of an organisation. It is established based on theoretical foundations from the *knowledge base* supported by the requirements from the *environment* to scientifically derive the proposed solution. Previous work on business and IT alignment and its assessment, Service-Oriented Architecture and Enterprise Architecture provide guidelines to establish a new solution design. Simon (1996) states that problem-solving research can be viewed as the exploitation of available means to reach desired ends while taking into account existing constraints in the environment. Moreover, the rigor of the research is obtained when existing foundations and methodologies are properly applied (Hevner et al., 2004). An initial solution is then the outcome from the second research activity that guides the solution development in the third research activity.
- In the third research activity, the development of the solution is carried out based on theoretical and methodological bases from the *knowledge base* that provides scientific rigour to underpin the solution. Multiple theories and methodologies from (strategic management, Socio-Technical Systems, Service Oriented Architecture, Enterprise Architecture, Task Technology Fit, Organisational Semiotics and stakeholders' theory) are adopted to develop an integrated business and IT alignment assessment method that provides a holistic view of an organisation. These theories and methodologies are combined in view of the state-of-the-art work in the business and IT alignment assessment that is developed by Sun et al. (2014) (discussed in Section 3.8.3). The solution is also developed while considering feedback received from the *environment*, which represents the problem domain. The purpose is to streamline the solution to address the problem according to the environmental requirements and constraints. The solution is continuously enhanced through the above-mentioned research activities to strengthen its capability of addressing the research problem.

- In the fourth research activity, the solution developed as an artefact in the previous research activity is evaluated within the context of a case study in Albaha University. According to Hevner et al. (2004), the understanding of the problem domain in the DSR is achieved through the implementation of the designed artefact, which is accomplished in this research activity. This research activity validates the utilisation of the developed solution to address the problem that is initiated in the first research activity. The solution is also evaluated by experts from the problem domain to determine its effectiveness and usefulness.
- In the fifth and last research activity, the outcomes from the evaluation activity draw the conclusion that represents the value of the solution as an artefact in terms of contributing not only to the *knowledge base*, but also to the *environment* as a potential practice. These contributions then feed back to the main sources of information supporting the evolving nature of this research, which conforms to the principles and behaviour of the DSR.

Adopted Research Methodology

The social aspects that are considered in this research, such as the understanding of people's behaviour, reasons and perceptions towards business and IT services, have shaped its social nature. However, other technical aspects from the IT perspective and the need to quantify socially driven attitudes and opinions are also involved. This leads to the adoption of a mixed methodology approach where a combination of qualitative and quantitative methods is used to serve different purposes in the research. The qualitative methods are mainly used to evaluate the solution through a case study that requires close involvement and constant interactions with various stakeholders related to the research. The adoption of qualitative research methods is then justified due to the particular focus that is given to the values of social aspects (Corbin and Strauss, 2014). However, the qualitative data that is collected is transformed into numerical values to simplify its discussion and analysis. This justifies the adoption of quantitative methods which are also utilised in the evaluation activity of the developed solution. Qualitative and quantitative data collection techniques that are adopted in this research are further discussed in the next section.

Case study is selected as an inquiry method in this research to empirically assess the alignment between business and IT services at an organisation's operational level through a developed assessment solution. The assessment takes into consideration the impact of social values from relevant stakeholders on the value of business and IT alignment. Therefore, it is

essential for the study to be carried out in a natural setting to determine the suitability of the solution. A public university from Saudi Arabia is chosen for this purpose as a case study setting that defines the scope of the investigation of this research.

4.3.2 Adopted Data Collection Techniques

Data collection for this research fulfils three objectives. First, preliminary data collected from Albaha University through a pilot survey aims to observe the research problem more clearly. Second, data collected from experts from the same university is used to confirm the findings in the literature to shape the developed solution and also to validate the solution after its application. Finally, data is collected from the university to empirically evaluate the developed solution through the case study.

Based on the adoption of a mixed methodology approach, different data collection techniques are selected. Table 4.3 illustrates the utilisation of these techniques in relation to the research phases and activities as described in the research framework in Figure 4.6.

Table 4.3: Research stages, activities, data sources and techniques

Research stage	Activity	Data sources and research methods	Research Techniques
Awareness of the problem	Identify the literature and practice gap in the alignment evaluation	Theories and methodologies, observation of real life case	Participatory observation, document analysis, pilot survey (Appendix C)
Suggestion for solution design	Identify alignment influencing factors and underpinning principles and methods to compose them into a conceptual model	Theories and methodologies	Document analysis
Developing the solution	Develop a solution based on underpinning principles and methods from the knowledge base and elicited additional requirements from the environment	Theories and methodologies, consulting practice	Document analysis, Open-ended Questionnaire (Appendix B)
Evaluating the solution	Evaluation of the proposed solution within the case study context	Case study, official documents	Questionnaires, Semi-structured interviews, Content analysis
Validating the solution	Evaluation of the solution acceptability by key stakeholders	Consulting practice (presentation and discussion)	Open-ended Questionnaire (Appendix D)

Working in the IT centre at Albaha University for nearly two years, the researcher observed continuous complaints from students about offered IT services. A pilot investigation was then carried out through an online questionnaire (Appendix C) at an early stage of the research to gain a better understanding of the quality of offered business services to students

at the university. Resulting poor business and IT services, based on the observation and the outcomes of the pilot study, set the scopes of the research problem and motivate its initiation, where a method to evaluate these services not only as isolated but as aligned is required.

A solution is then suggested based on an intensive investigation of relevant literature and practices. The factors that influence this alignment and the underpinning methods for analysing business and IT alignment are identified in this stage. This leads to the development of the solution whilst also confirming its relevance to the problem identified at the university through an open-ended questionnaire with experts from the university (Appendix B). This collaboration, which is supported by DSR's iterative feature, facilitates the improvement of the solution in a scientific and methodological manner.

The developed solution is then evaluated through a case study where the researcher engaged with stakeholders from Albaha University through questionnaires and semi-structured interviews for three months. After the application of the solution at the university and the analysis of its outcomes, experts from the university are engaged with the researcher in a discussion session through Skype to provide feedback about the feasibility, usability and usefulness of the solution (Appendix D).

4.3.3 The Data Source for this Research

Maintaining proper alignment between business processes and supporting IT resources is a concern that extends to include both public and private organisations across different sectors. However, IT alignment research in the higher education sector has received less attention than organisations in many other sectors (Karpovsky and Galliers, 2015, Ullah and Lai, 2013), although this sector faces the same pressure that any other organisations could face. Higher education institutions have to reduce costs, improve outcomes and ensure that IT services are aligned with business needs. This sector is also considered to be the front line partner of organisations and more IT alignment research attention has to be devoted to it (Ullah and Lai, 2013). For these reasons, a public university is chosen for its socially rich environment and also for its service-based business nature where it provides multiple services to its students, academic staff and local community. Background information about the chosen university is provided next.

4.3.3.1 Background about the Higher Education Sector in Saudi Arabia and Albaha University

In recent years, the Higher Education (HE) sector in Saudi Arabia has gone and is still going

through tremendous growth and reform, more specifically in terms of enhancing teachers' capabilities, curriculums and technology (Smith and Abouammoh, 2013, Alamri, 2011). Smith and Abouammoh (2013) point out that there is an overwhelming desire among Saudi universities to achieve 'world-class' standards in teaching and research. However, without a clearly articulated vision and objectives, 'world-class' standards are not likely to be achievable. Converting a written vision, mission and strategies into reality is what these universities need to achieve desired outcomes.

One of the fundamental characteristics of the HE system in the Kingdom of Saudi Arabia is that it is centralised in terms of control and educational support (Smith and Abouammoh, 2013). This means that the ministry of higher education, along with a number of specialised quality assurance and assessment centres, have the responsibility to plan, coordinate and supervise the higher education sector in the kingdom.

Albaha University is a twelve-year-old public university that was founded in late 2006. According to formal statistics shared by the university, it has 15 schools that span over 6 different geographical areas covering the wide region of Albaha province (11,000 square km), south-west of Saudi Arabia. By September 2016, when the case study was conducted, there were 25,385 registered students, 1,645 academic staff and 833 employees. The university offers 64 undergraduate programmes, 14 master programmes and 3 programmes for higher diploma. The number of students is steadily increasing each year, from only 13,793 in 2008 to more than 25,000 in 2016.

Financially, the university receives its financial support annually from the government and the budget that was provided to the university for 2016 was £250,864,873.15. The income of the University for the Year of 2016 was only £1,197,547.56 since the university is still not seeking profits from its provided services at the moment. In terms of its IT technical capabilities, Albaha University was ranked 10th (among 23 public universities) for adopting and providing electronic services to its key stakeholders, as evaluated by an e-government transformation programme in September 2016 (The Saudi eGovernment Program, 2016). Colbran and Al-Ghreimil (2013) studied the adoption of educational technologies among Saudi universities and found the lack of IT infrastructure, training and support, as well as websites and software problems as the main inhibitors of successful adoption of educational technologies in the country.

Data is collected from multiple departments at Albaha University including the departments of quality assurance, finance, IT, library affairs, students' services, admission and the information unit department. However, for the factors that need to be closely analysed

through students' perceptions (i.e. perceived values about business services and perceived values about supporting IT services), the school of Computer Science and Information Technology (male section) is chosen as the data source. This is because there were 28 sets of questionnaires that have had been customised for each business and IT service under investigation and it was not possible to extend this across the university level. Academic staff from the male section have also provided support through the distribution and administration of the questionnaires during their lectures. The collection of large data sets from students along with other data collected elsewhere from the university would have been impossible without such localised support. According to the university's official statistics, there were 160 male and 380 female students registered at the school of CS and IT during data collection in September 2016.

Albaha University was specifically chosen because it was the only university that provided permission for applying and evaluating the developed method in their institution among seven Saudi universities that were contacted (the permission is attached in Appendix H). Although Albaha University does not have outstanding IT capabilities compared with some other Saudi universities, they are sufficient for successfully applying the method and showing its capability due to the support and collaboration that were provided by decision-makers, academic staff and students from the university.

4.3.4 Adopted Evaluation and Validation Approaches

Research evaluation and validation are usually influenced by adopted research methods. For instance, Vaishnavi and Kuechler (2015) discuss a particular set of validation patterns that are applicable to evaluate an artefact in information systems research. This research adopts a case study for evaluating the developed solution through a mixed methodology approach. However, to determine the validity and viability of the solution, a content validity approach guided by aspects from Technology Acceptance Model (TAM) (Davis, 1989, Platts and Gregory, 1990) is developed.

In this approach, a board of experts from Albaha University working at the school of CS and IT, and also at the university IT centre is asked to provide feedback about the feasibility, usability and usefulness of the developed solution (Appendix D). They are considered to be the most knowledgeable people with regards to business-aligned IT issues at the university. The feasibility and usability aspects aim to assess whether the developed method can be applied, and how easily can it be applied, respectively. The usefulness aims to assess the benefits of the solution to the university based on its outcomes. According to Sonnenberg

and vom Brocke (2012), expert interviews and surveys can be used to evaluate the usefulness of an artefact. A detailed discussion of the outcomes of this validation approach is presented in Chapter 7.

The development of the solution (i.e. the alignment evaluation method) as an artefact is fundamentally based on existing kernel theories and methodologies that have been applied and tested to ensure the solution's internal validity. The move of multiple analysis techniques defined in the developed solution together as an intellectual whole to assess business-aligned IT services indicates its construct validity. However, the external validity of the solution is not achieved due to the constraint of the application of the solution in a single case study. Nonetheless, we believe that since core business and IT services at higher education institutions have been analysed through the application of the solution at Albaha University, other local and possibly international schools and universities could adopt the method to assess alignment between business and IT services.

4.4 Summary

This chapter provides a description of the research approaches and methods that are adopted in this research to develop, evaluate and validate the artefact that is designed to facilitate the assessment of business and IT alignment at the operational level of organisations. The selection of the most appropriate research approaches has not been made without an awareness of different research paradigms, methodologies, methods and techniques that are applicable to Information Systems research. Among different research approaches, the Design Science Research (DSR) is found the most suitable for the problem-solving nature of this research. The lack of comprehensive evaluation mechanisms to assess business and IT alignment at the operational level of organisations from the knowledge base supported by a real-world problem are addressed in the developed solution following the guidelines of DSR. In this, a research framework is developed which consists of five main research activities that are followed to achieve the research aim and objectives.

In the first research activity, full awareness of a real-world problem is achieved supported by its relevance to the state-of-art research in business and IT alignment assessment. After the scope of the problem is defined, efforts in the second research activity are dedicated to finding a suitable solution that is backed by theoretical and methodological foundations. The solution is then developed and enhanced throughout the third research activity resulting in a solution as an artefact. In order to evaluate the viability and effectiveness of this artefact, a case study as an inquiry method is adopted from a real-life organisation, where an in-depth

investigation is carried out, in the fourth research activity, to examine the business analysis techniques defined in the artefact. Due to the involvement and examination of multiple social and technical aspects in the business and IT alignment assessment process, a mixed methodology approach is found suitable for guiding the selection of appropriate qualitative and quantitate research methods. The outcomes from the evaluation activity draw the conclusion, in the final research activity, which represents the value of the solution as an artefact in terms of contributing to the knowledge base and the environment as a potential practice.

As mentioned earlier, the business and IT alignment assessment artefact is developed and evaluated through five research activities. However, the artefact itself consists of four main stages that are integrated to conduct business and IT alignment assessment and provide feedback and recommendations based on this assessment to enhance business performance as discussed in the following chapter.

Chapter 5
B-ITAAM: Business IT Alignment Assessment Method

This chapter describes the Business and IT Alignment Assessment Method (B-ITAAM) as a methodological solution that facilitates the evaluation of business and IT alignment at the operational level of an organisation. The principles, concepts and methods from which the B-ITAAM has been derived have been discussed in previous chapters. This chapter, however, focuses mainly on presenting the methodological view of B-ITAAM and describing its building blocks (i.e. the business analysis techniques). These techniques are then implemented in a real-life case study in Chapter 6.

5.1 An Overview of the Proposed B-ITAAM

The alignment focus in this research is clearly described as the fit between business services and supporting IT services with a view to maximising the value that IT can bring to the organisation. The assessment of this alignment at the operational level of an organisation is a complex process, especially when multiple technical (tangible) and social (intangible) factors are taken into consideration to obtain a holistic value of this alignment. The proposed Business and IT Alignment Assessment Method (B-ITAAM) addresses this issue and offers a method that comprises a set of business analysis techniques that enable business and IT alignment analysis and assessment while taking both tangible and intangible factors into account. B-ITAAM links the strategic level of an organisation with the operational level through Key Performance Indicators (KPIs) to guide the alignment assessment. This is to ensure that any efforts spent on the alignment assessment are devoted to operational services that are of current and future importance to the organisation's success (Bauer, 2004). The derivation of rational recommendations and feedback to enhance the operational performance and the capabilities of an organisation are the expected outcomes from the implementation of this method.

Figure 5.1 provides a methodological view of the proposed B-ITAAM, where the analysis, alignment, assessment and recommendations of business-aligned IT services are undertaken in four interrelated stages. Briefly, the first stage examines the strategic level of an organisation and its current competencies and guides the operational business and IT analysis in the second stage through a derived set of KPIs that are mapped to related business

services. The mapped set of business services and their supporting IT services are then individually analysed and profiled in the second stage, allowing for a comprehensive understanding of these services and their capabilities. The analysis in this stage goes into more detail to investigate business processes and application components of business services and IT services, respectively.

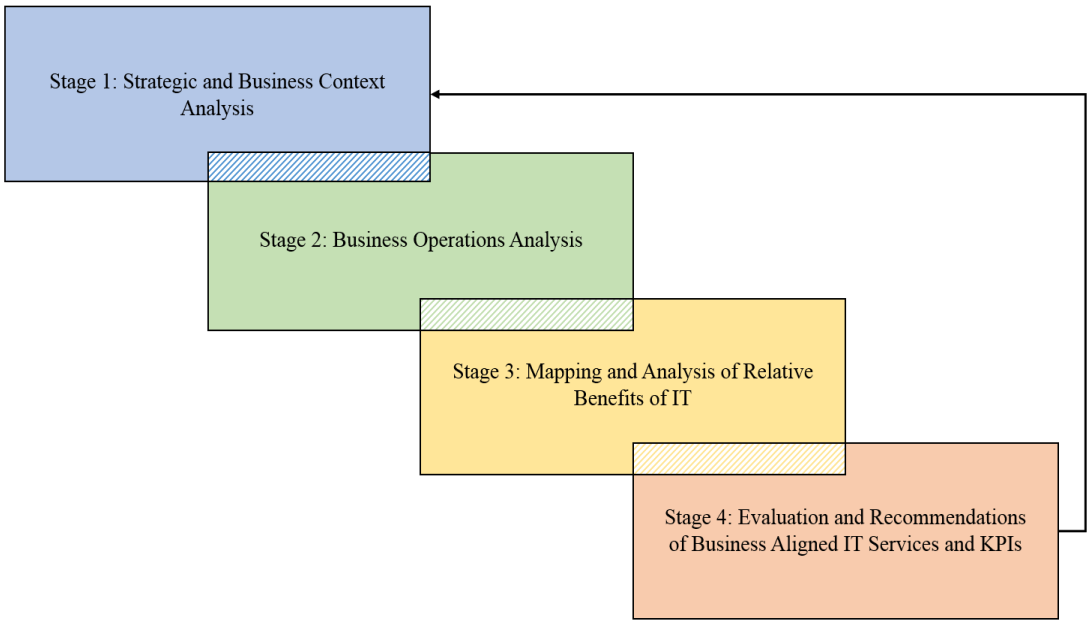

Figure 5.1: A methodological view of the proposed method

This then triggers the third stage of analysis where business and IT services are mapped through IS services and these mappings are evaluated through five tangible and intangible factors to determine the relative benefit values of IT services to mapped business services. The resultant values from this stage are then used as inputs to the fourth stage of analysis. In this last stage, these values are incorporated with business service values that are analysed in the second stage to determine the impact of business service performance on the value of IT through a set of defined algorithms. The outcomes from this stage pave the way for recommendations for enhancing the analysed set of business and IT services, and also for providing feedback about the operational performance of the organisation in relation to its defined strategic goals. The documentation of these recommendations and feedback in the business context analysis form indicates the end of the B-ITAAM cycle.

From a detailed view, B-ITAAM defines a set of fourteen business analysis techniques that guide a comprehensive practical analysis and assessment of business and IT services driven by business goals. Figure 5.2 depicts the B-ITAAM and these techniques and the methodological process of their roles played in alignment.

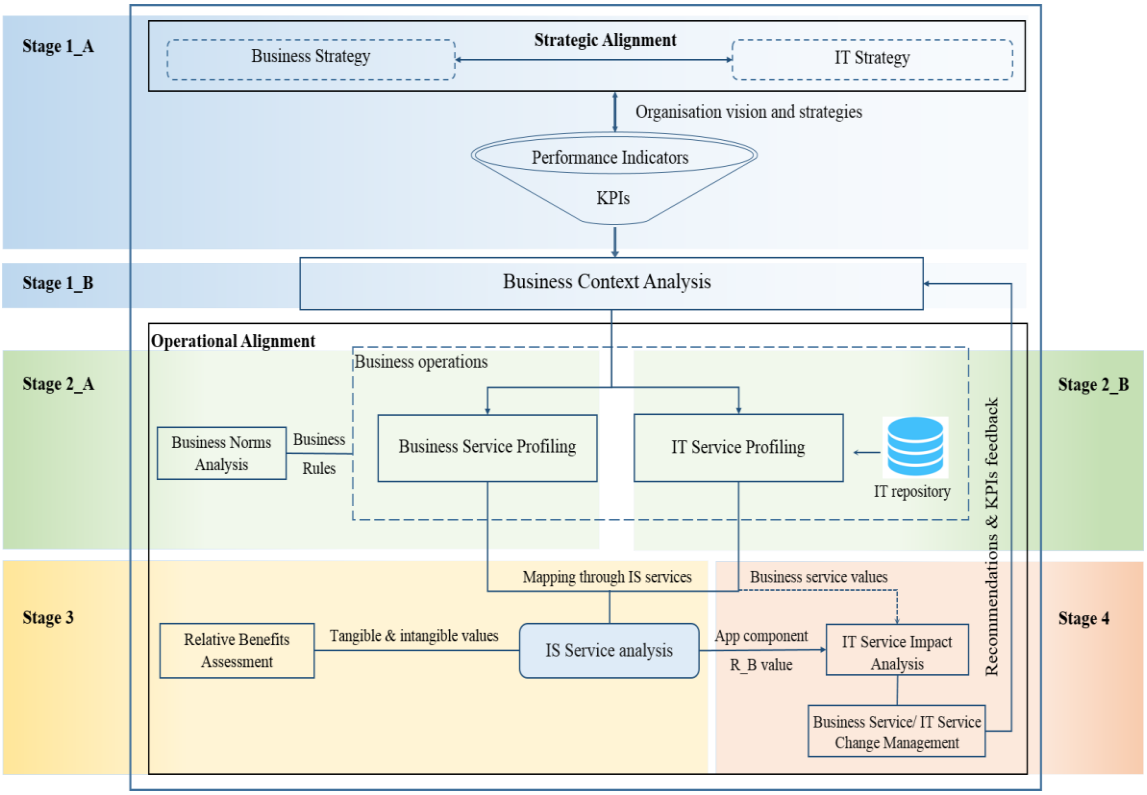

Figure 5.2: The Business IT Alignment Assessment Method (B-ITAAM)

In the first stage, the strategic and business context of an organisation are analysed in Stage 1_A and Stage 1_B, respectively. First, the derivation of a set of KPIs from the business strategies to guide the operational assessment of business and IT services is performed through *KPIs Derivation* technique. Then, the business context analysis of the organisation is carried out through the *Business Context Analysis* technique by extracting background and current information about the organisation which demonstrate its competencies. A subset of KPIs that represents a high priority to the organisation is then mapped to related business services through a *KPIs to Business Services Mapping* process in order to guide the analysis of business operations in the second stage.

In the second stage, a set of business and IT services that are guided by the KPIs to Business Services Mapping from the first stage are individually analysed and profiled. In this sense, the *Business Service Profiling* technique groups the specifications and capabilities for each business service into a single profile. The following techniques are devised to support business service analysis and profiling in Stage 2_A: *Business Norms Analysis, Business Service Strategic Value Assessment, Business Service Efficiency Analysis, Perceived Business Service Performance, and IS Service Criticality Analysis*.

Computing resources that are consumed by profiled business services are then defined as IT services in Stage 2_B. Each IT service is also profiled independently from business

services through the *IT Service Profiling* technique. Information to create these IT profiles is retrieved from an IT repository that is separately created through *IT Repository Analysis*. Clear representation of business and IT services and their capabilities is achieved by the end of this stage, facilitating their mapping in the third stage of analysis.

In the third stage, IS services are defined to map business services with corresponding IT services, with this definition facilitating the evaluation of their alignment through a number of defined tangible and intangible factors. These factors are analysed through the following techniques: *Users' Perceptions towards IT Application Components*, *Technical Quality Analysis of IT, Financial Gains Acquired from the Acquisition and Implementation of an IT Application, the Usage Pattern of an IT application,* which is subjectively analysed and also through real time data, and, finally, *IS Service Criticality Analysis,* which specifies the degree of importance of IT support to the business. These factors are individually analysed for each mapping, consisting of a business service, IT service and the IS service that maps them together. A single value is generated as an output of this stage for each mapping to reflect on the relative benefit from each IT service to its related business service.

In the fourth stage, for each mapping, the single relative benefit value of an IT service produced by the end of the third stage is combined with other previously analysed business service values to examine the impact of business service performance on the value of IT and also to pave the way for recommendations to business and IT services. Recommendations to enhance the organisational operation in respect of organisational changes are then derived, along with feedback on how successful the organisation's performance was in relation to its business goals. These recommendations and feedback are then documented in the business context analysis form indicating the end of one B-ITAAM cycle.

Each stage in the B-ITAAM, along with its defined business analysis techniques, is discussed in more detail in the following sections.

5.2 Stage 1: Strategic and Business Context Analysis

The purpose of this stage is to initiate the evaluation process of the business and IT alignment at the operational level, which begins by understanding and addressing the organisational operation from a strategic perspective. This links the strategic level with the operational to assess whether business operations are being performed according to the business goals and strategies from an alignment analysis point of view. Three analysis techniques are defined

in this stage to derive a set of KPIs from business strategies and goals, to link these KPIs to related business services so as to guide the business and IT alignment assessment at the operational level, and, finally, to analyse the current business context and capability of the organisation. For simplicity, this stage is further divided into two sub-stages.

5.2.1 Stage 1_A: Strategic Analysis of an Organisation

The strategic level of business and IT alignment as depicted at the top of Figure 5.2 is not the focus of assessment in this research. However, aspects from this level including vision, mission, Critical Success Factors (CSFs), strategies and goals can assist in the derivation of a list of Performance Indicators (PIs) to measure the operational performance of an organisation (Parmenter, 2015). These strategic aspects can be obtained through a content-analysis of the strategic documentation of an organisation. Since many organisations worldwide use PIs and KPIs to monitor daily performance in relation to strategic objectives and goals (Parmenter, 2015, Swan and Kyng, 2004), we initially assume that the derivation and documentation of PIs have been established in organisations that aim to apply B-ITAAM. However, a simple sequential technique based on strategic management concepts and principles is developed by the researcher and offered in Figure 5.3 to assist for the derivation of PIs from business vision and strategies.

Performance Indicators Derivation					
Organisation name:			Date:		Version No:
Vision	Mission	Strategic objectives	CSFs	Strategies	PIs

Figure 5.3: Performance indicators derivation technique

Some PIs are more important than others and they are then called ‘Key’ Performance Indicators (KPIs) (Parmenter, 2015). Therefore, number of PIs can be prioritised by an organisation at certain times due to strategic or operational circumstances to become KPIs. These KPIs tell the management board of how an organisation is performing against its goals, and the management board can also increase the performance dramatically once these KPIs are monitored. Multiple subjective and objective criteria, including technical and non-technical ones, have to then be considered by an organisation as measures that influence and contribute to the violation of the KPIs’ desired values. Once a list of KPIs is derived and prioritised as an output of this technique, it is used as an input in the following technique to link KPIs with relevant business services.

According to Lohrmann and Reichert (2013), KPIs allow distinct tracking of the performance of business services. This enables KPIs to be mapped to relevant business

services to guide the operational investigation of the alignment between these services and their supporting IT services at the operational level. The technique developed by the researcher in Figure 5.4 is aimed at facilitating this mapping. Based on the scope of this research, the mapping between KPIs and business services is restricted only to those business services that are supported by IT services. This enables further business and IT alignment evaluation to take place in the following stages of analysis. Where applicable, the assessment criteria that might have already been developed by an organisation to measure KPIs can be documented in this technique along with its outcomes, so that they can be compared against the outcomes of the B-ITAAM at a later stage of analysis.

Mapping KPIs to Relevant Business Services		
KPIs	Assessment Criteria	Business services that can be synced to KPIs for further alignment assessment

Figure 5.4: Mapping of KPIs to relevant business services

A set of KPIs mapped to a set of realised business services is the outcome of this technique. This set of KPIs is then documented in the Business Context Analysis technique, which is discussed next, under one theme to point out the issue of concern that is under investigation by the B-ITAAM. The set of mapped business services is going to be the focus of the business and IT alignment analysis and assessment in the following stages.

5.2.2 Stage 1_B: Business Context Analysis

Business Context Analysis (BCA) is a central analysis technique that is developed by the researcher in the B-ITAAM (see Figure 5.5). In this first stage of analysis, BCA represents the current state and competency of an organisation though the set of business and IT aspects that are articulated, structured and documented. For other stages, BCA captures information related to business and IT aspects from the strategic level and makes them available to serve as the basis for the evaluation at the operational level. Therefore, this central analysis technique guides and manages the analysis and recommendations of business-aligned IT services to be in line with the organisation's character, rules, capabilities and relevant stakeholders' needs.

Business Context Analysis			
Organisation name:	Date:	Version No:	
Organisational Aspects	**Document reference**	**Key aspects**	**Theme under assessment/ KPIs**
Description of the organisation			
Vision and mission			
Critical Success Factors			

Business strategy			
IT strategy			
Code of practice			
Historical facts			
Business structure			
Organisational structure			
Strategic units			
External stakeholders			
Financial overview			
Statement of cash flows			
Income statement			
Statement of financial position			
Recommendations and feedback			
Proposed recommendations to analysed business services			
Proposed recommendations to analysed IT services			
Feedback on KPIs			

Figure 5.5: Business context analysis technique

In this analysis technique, general and specific information about the organisation is extracted from official documents and recorded with a reference number to form the organisation's current business context. Extracted information includes business and IT strategies, codes of practice, and historical and up to date information related to financial and structural aspects of the organisation. For the purpose of reporting to the management board of the organisation, a number of KPIs can be grouped together under one theme and documented in the BCA (McGloin and McGloin, 2010). This grouping enables a temporary selection of two or more KPIs that address a critical issue to be assessed in the following stages of analysis. The selection of a set of KPIs can be made based on: the criticality of a group of stakeholders that a set of KPIs is linked with and who always need to be satisfied; an area of concern that is critical to an organisation's success at a specific time; or even by key words to address operational issues linked to an emerging matter of concern. This enables the B-ITAAM to report back to a block of KPIs and their associated business and IT services under one theme each time that it is initiated.

This stage of analysis offers as an output a clear view of the organisation's current status, competencies, rules and regulations along with a list of KPIs that is mapped to related business services to guide and manage the business and IT analysis, alignment, assessment and recommendations in the following stages of analysis. The recommendations that result

from the whole evaluation process are then documented back in the BCA as a reference of one completed evaluation process that addresses one strategic theme of concern for the organisation at a specific time.

5.3 Stage 2: Business Operations Analysis

The purpose of this stage of analysis is to analyse the organisation's business operations that are guided by the set of KPIs that has been prioritised in the first stage, which specifies a number of business services as the focus of the business and IT alignment analysis. Eight analysis techniques are defined at this stage in order to analyse and profile business and IT capabilities, which will then pave the way for mappings and assessment in the following stages of B-ITAAM. The analysis in this stage addresses, first, business services by analysing and profiling their efficiency and effectiveness going through business processes. It then moves on to examine and profile the capabilities of supporting IT resources going through application components. These two groups of analysis are conducted independently in Stage 2_A and Stage 2_B, respectively. Both business and IT services meet at the point where they are governed by business norms to control their behaviour.

5.3.1 Stage 2_A: Business Service Analysis and Profiling

Business service profiling involves an individual profiling of each business service under investigation in one referenced document as shown in Figure 5.6. This profiling approach of business services is adapted from the work of Sun et al. (2014) with more incorporation of business service elements. The purpose is to capture and group the elements that illustrate the business service capability and make them available for retrieval during the alignment assessment stage. The grouping of multiple business service elements together in this profile is based on the business service schema that is presented in Section 3.2.2. In each business service profile, the name, goal and description of the service under analysis are documented along with the analysis date and reference number for future retrieval. The realised KPI by the performance of the business service and the relationship of the business service with other business services are also documented.

Business Service Profiling		
Business service name:	Date:	Version no:
Business service goal:	Business norms:	
Business service description:		
Realised KPI:		
Business capability	Business service strategic value (BSSV):	
	Perceived business service performance (PBSP):	

	Business process model:	Business service efficiency (BSE):
Business service cross-reference:		
IS service (ISC):	IS criticality to business service (ISCB):	

Figure 5.6: Business service profiling template (adapted from Sun et al., 2014)

Other documented elements in the business service profile include its strategic importance value, associated rules and regulations as business norms, realised business processes and their efficiency value, associated stakeholders and their perceptions towards the performance of the service, and the required IS capability to support the business service performance. Five business analysis techniques are adopted, adapted and devised for this set of elements to be analysed and documented in the business service profile, as discussed in the following sections.

5.3.1.1 Business Norms Analysis

As previously discussed in Section 2.3, business norms are the formal and informal rules that cover different parts of an organisation, providing standards by which people, activities and systems can act accordingly. Being an integral part of an organisation, business and IT services therefore have associated norms to control their behaviour. In the following, a norm analysis technique is presented (see Figure 5.7), which is defined in the B-ITAAM to assist the articulation of business norms associated with business and IT services. The technique is formulated based on the norm construct described in Stamper and Liu (1994).

Norms Analysis		
Norm label:	Date:	Version no:
Description:		
Principles reference:		
Whenever <*condition*>		
If <*state*>		
Then <*agent*>		
Is <*deontic operator*>		
To <*action*>		

Figure 5.7: Business norms analysis technique (adapted from Stamper and Liu, 1994)

This technique articulates and keeps record of social aspects and rules that influence the behaviour of business and IT services in an organisation. This then enables clear understanding of surrounding aspects influencing any recommendations to be made for these services. Articulated norms for each business service are then documented in corresponding business service profile as business norms.

5.3.1.2 Business Service Strategic Value

Each business service under investigation in this stage of analysis is assigned a strategic value through the Business Service Strategic Value (BSSV) classification technique that is shown in Figure 5.8, which is adapted from the work of Porter (1985). According to the value chain theory, business services can be categorised as either primary or secondary services (Porter, 1998). This categorisation enables organisations better understand the business services that contribute the most value to an organisation and its competitive advantage (Kohlborn et al., 2009). This strategic tangible value is determined by the business strategy in order to discern how important each business service is in a business setting.

Business service		**Value-adding type**	**BSSV**
Orientation	**Primary (P) or Secondary (S)**		
Regulatory (internally oriented)			5
Externally oriented	P	Customer core value-adding	5
	P	Customer non-core value-adding	4
Internally oriented	P	Primary business value-adding	3
	S	Secondary business value-adding	2
	S	Non business value-adding	1

Figure 5.8: Business service strategic value (adapted from Porter, 1985)

Based on this technique, the criticality of a business service, according to the organisation's strategic plans can be assigned a tangible value from 1 to 5, where 5 represents the highest value that indicates the strategic importance of a business service. Accordingly, the value that a business service may add to the overall business can be as follows:

- **Regulatory:** business services under this category are mandatory and their absence could affect the overall business operations of the organisation.
- **Customer core value-adding:** business services under this category add direct value to an organisation's customers. They are considered to be unique business services that no other business services can provide their functionality.
- **Customer non-core value-adding:** business services in this group also provide business services to external customers. However, the values added to customers can be provided by alternative business services.
- **Primary business value-adding:** business services under this category are primary adding value to the business operations, which subsequently influence the added value to customers.
- **Secondary business value-adding:** business services under this category are secondary business services that are considered to only add values to the organisation

internally. The existence of such business services adds value to the overall operations.

- **Non business value-adding:** business services under this category add no value to the organisation. Their existence might serve a trivial task that can be omitted from the organisational operation.

The strategic values of the analysed set of business services as an output of this technique are then documented in related business service profiles. This strategic tangible value of a business service, which can also be specified by a business service representative, is further complemented by other tangible and intangible values so as to comprehensively analyse the real-time performance of a business service. The tangible value is assessed through a business service efficiency analysis, where the outcomes of involved business processes are measured based on successful utilisation of allocated resources to achieve the business service goal within a planned time. The intangible value, on the other hand, is measured through the social value of stakeholders who consume the service through perceived business service performance analysis. These two values are derived through the following devised techniques.

5.3.1.3 Business Service Efficiency Analysis

The purpose of the Business Service Efficiency (BSE) analysis is to analyse the performance of a business service from an objective point of view so as to have concrete evidence about its behaviour during the alignment assessment stage. The efficiency of a business service can be evaluated through the analysis of how efficient each involved business process is in utilising allocated resources to achieve the business process goal within a specified time-frame. Therefore, this concrete BSE value can be used on its own or with other derived intangible values to reflect on the performance of a business service. According to Trischler (1996), a business process is efficient when the input is converted into output in the shortest time possible with minimal utilisation of resources, while a business process is effective when it satisfies one or more business objectives and meets or exceeds stakeholders' needs. The latter is examined through the next business analysis technique in Section 5.3.1.4.

A business process with low levels of efficiency may affect the overall efficiency value of an offered business service and therefore its perceived quality. Thus, involved business processes should always maintain high levels of efficiency in order to create a positive impression for customers. Each business process can then be assigned an efficiency value as High (H), Medium (M) or Low (L) according to defined business norms. These norms

specify both the minimum number of required actors and the acceptable level of delay in respect of the time by which activities associated with a business process should be completed. This is known as a tolerance value, which, according to Zeithaml et al. (1993), can act as a subjective value of reference that reflects on business service quality. According to Whitt (1999), customers will usually have different delay thresholds, but we assume in this research that delay thresholds in business processes are specified in business service rules with different level of variances. While some business processes may have strictly zero level of tolerance, we assume in this research that other unspecified tolerance values may have up to 20% of tolerance from the total specified time of the business process.

Johnston (1995) specifies three zones of tolerance linking together customers' pre-expectations, real performance and outcomes in order to evaluate customers' satisfaction towards provided services (see Figure 5.9). For the analysis of business process efficiency, these zones are adapted into a new technique - that is developed by the researcher – to assess the performance of business services. In this sense, when a business process is completed on or within time, it is assigned (H); when it is completed within 20% or less from a specified time, it is assigned (M); beyond that, the business process efficiency is assigned (L). For business processes that have zero level of tolerance, they are treated as either of high efficiency if completed within specified time-frame, or low if otherwise. In the case where two or more business processes realise one business service, delays in business processes are aggregated to calculate the overall value of BSE following zones of tolerance, as explained in Figure 5.9.

Pre- expectations	**Completion time of a business process**	**Outcome value**
More than acceptable	Business process is completed on specified time or less	High (H)
Acceptable	Business process is completed within 20% from specified time frame	Medium (M)
Unacceptable	Business process outcome is provided beyond 20% from specified time	Low (L)

Figure 5.9: Zones of tolerance of business process efficiency (adapted from Johnston, 1995)

The analysis of a BSE can be performed on one random instance of the business service behaviour. Then on a scale from 1 to 5, the BSE value can be assigned. 5 indicates that the business service is efficient in meeting time constraints with allocated resources, 3.5 indicates a medium level of efficiency of the business service, while 1 is assigned to business services that are inefficient.

Business process modelling is considered in this BSE analysis to provide a structural

representation of the business processes that are involved in a given business service. Rules and time constraints are also specified on the business process model, providing a clear view of the business service processes and their associated constraints. As an outcome of this technique, each business service under analysis is assigned an efficiency value based on a clear business process representation and analysis.

5.3.1.4 Perceived Business Service Performance Analysis

The purpose of this Perceived Business Service Performance (PBSP) analysis is to provide another dimension for observing the performance of a business service, but this time from the perspective of engaged stakeholders. This intangible value complements the tangible one that is derived through the previous technique to reflect on the performance of a business service from subjective and objective perspectives. These business service values are then documented in related business service profiles for each business service under analysis and used towards business and IT alignment assessment and recommendations in the following stages of analysis. Figure 5.10 shows the criteria that are used in the PBSP analysis technique, which is guided by the work of Hall (1959) and Hofstede and Hofstede (2001). The calculation of the PBSP value is then carried out through the application of the *valuation framing* technique to provide a holistic valuation of the social perspective from multiple associated stakeholders engaged with the business service (the valuation framing technique is discussed in Section 2.3.5).

Perceived business service performance						
Business service name:		Date:			Version No:	
No.	Assessment criteria	CW / SW	Stakeholder 1	…	…	Stakeholder n
			0.00	0.00	0.00	0.00
1	The offering of the business service is clearly defined	0.00				
2	The business service is delivered to end consumer in a timely efficient manner	0.00				
3	The business service is deemed crucial to the end consumer	0.00				
4	Risks can be imposed to the data of the business service consumer	0.00				
5	A mechanism to provide feedback on business service offering is accessible	0.00				
6	Consumers can deal with the business service with no additional required knowledge and skills	0.00				
7	End consumer's expectations from the business service are met	0.00				
$V_i = \left(\sum_{j=1}^{7} sv_j \times cw_j\right) \times sw_i$ *						
$PBSP = 1 + \left(\sum_{i=1}^{n} V_i - LV\right) \times \frac{(5-1)}{(HV-LV)}$ **						

Figure 5.10: Perceived business service performance analysis technique

**V_i: a total rated value for each stakeholder; sv_j: a stakeholder perceived value ranging from totally disagree (-3) to totally agree (3); cw_j: a weight assigned to a criterion; sw_i: a weight assigned to a stakeholder.*

*** LV : the lowest value of v; HV : the highest value of v.*
Note: HV should not equal LV in this assessment, but when $HV = LV$ then $PBSP = HV = LV$

Stakeholders will then provide their perceptions about the performance of a business service as either a gain or pain value that ranges from -3 to 3, where -3 refers to the lowest possible value, indicating total disagreement with the defined criteria. Each criterion is provided with a weighting value by the business service owner to reflect on the degree of importance of some criteria over others in the assessment. The business service owner not only has the knowledge and final decision for any business-related issues in regard to the business service, but he/she is also responsible for the service strategy from a business perspective (Belter et al., 2010). Weighting values can also be assigned by the business service owner to each participating stakeholder to reflect on his/her level of impact on the total value of the business service perceived performance.

The resulting overall value from the calculation of the PBSP for a single business service is a value that ranges from 1 to 5, with 5 indicating the highest possible value that reflects a positive attitude towards the performance of the business service. High (H), Medium (M) and Low (L) levels are applied to indicate the PBSP as shown in Figure 5.11.

Level	Minimum value	Maximum value	Percentage
H	4	5	>= 80%
M	3.25	3.99	>= 65% - < 80%
L	1	3.24	< 65%

Figure 5.11: Perceived business service performance value guide

For a business service that scores less than 3.25 in this analysis and *low* in the previous business service efficiency analysis, it is discarded from any further business and IT alignment evaluation since more consideration of the performance of this business service has to be taken into account by the management board prior to any further IT alignment analysis.

5.3.1.5 IS Service Criticality to the Business

This analysis aims to clearly determine the level of criticality of the IT support that is required by each business service under investigation. In assessing business and IT alignment, it is not sufficient to determine the criticality of business services and IT services independently. Therefore, a third dimension is considered by IS service criticality that bridges business and IT services and reflects on the importance of the business-aligned IT mapping initiated between them. The higher the criticality of the IS service, the higher the importance of the linkage between the business service and its supporting IT service. IS

service criticality values can be retrieved from the strategic plans of an organisation, where the need or criticality of the automation that is required by an IT service to support a business service is documented. Therefore, on a scale from 1 to 5, with 5 being highly critical, the IS service value can be assigned. The business manager or service owner can also specify how much an IS service capability is critical to business needs (Sun et al., 2014).

By the end of Stage 2_A, the analysis of business services under investigation is completed and the outcomes from different business-related analysis techniques are profiled independently for each business service, providing valuable information that reflects on the capability of these services. Supporting IT services are then independently investigated and documented in Stage 2_B, allowing the mappings with analysed business services to be carried out in the third stage of analysis through the B-ITAAM.

5.3.2 Stage 2_B: IT Service Analysis and Profiling

This sub-stage of analysis aims to continue the business operations analysis of an organisation, but this time with focus placed on computing resources consumed by the analysed set of business services in Stage 2_A. Computing resources supporting business services are described as IT services that comprise IT applications and IT infrastructure components (Van Eck et al., 2004). IT infrastructure components refer to data storage, network and hardware, while application components refer to those replaceable and reusable self-sustained units of functionality. In this sub-stage of analysis, computing resources are described through an IT repository that acts as a catalogue for storing information about existing IT capabilities at the operational level of an organisation. This IT repository then provides required information for creating IT service profiles.

5.3.2.1 IT Repository

The development of an IT repository for an organisation in this phase of analysis is not intended to replace any existing repository or inventory systems in the organisation. However, it is intended to capture main specifications and cost aspects of IT resources, which can be helpful in carrying out an assessment of business and IT alignment. In the IT repository template developed by the researcher in Figure 5.12, main specifications include: item name, type, source, current status, functionality features, granularity level, criticality to the business, level of integration, level of usability, targeted users and the age of the item. Item type refers to different types that an item can be such as an IT application, storage or network, which is important in that it distinguishes different IT resources within an

organisational operation. An item source, however, refers to different sources of an item such as “custom-built”, “Off-the-Shelf (OTS)”, “open source”, or “outsourced” for items that are defined as IT application items. The current status of an item refers to whether or not the item is actively functioning at the moment of carrying out the analysis through B-ITAAM.

The main functionality features of an item refer to its capabilities, while its criticality defines how critical an item is to an organisation’s mission, such that it can be specified as either “mission critical” or “not critical”. The granularity level of an item describes the domain that an item serves, which could be either “organisational level” or “unit/ departmental level”. The level of integration refers to the level of interaction between an item and other items that exist at the organisation’s operational level. The usability level of an item from an end user perspective refers to its level of usage as being either “more frequently used” or “less frequently used” according to real-time data provided by the IT department. The targeted users refer to the group of stakeholders who are the main users of an item. Finally, the age of an item refers to the date at which the item was procured.

On the other hand, cost drivers involve the costs that are incurred from purchasing and the maintenance to changing costs that might be incurred; for example, due to urgent upgrades that are required. Determining these cost aspects is an important tangible feature that has to be revised before any decision can be made to enhance or remove an IT resource. Regular updates of this IT repository are recommended to ensure readiness for any future business and IT alignment assessments that should be conducted in regular basis.

IT Repository														
Item main specifications											Cost Drivers			
Item Ref	Item name	Item Type and source	Item status	Functionality features	Criticality to the business	Granularity level	Level of Integration	Level of usability	Targeted users	Age	Purchase cost	Maintenance cost	Change cost	TCO
#	X	App; Storage; Systems; Visual systems; Network, etc. Custom made; OTS; Open Source; Outsourced	Active or passive	Main functionalities of the item	Mission critical or not critical	Organisation level; Department/ unit level	Level of integration with other items	More frequently used item Less frequently used item	Who are the main users of the item?	In stock date	£	£	£	£

Figure 5.12: IT repository template

5.3.2.2 IT Service Profiling

The purpose of forming IT service profiles is to group important information about each IT service that supports one or more business services. This information can then be retrieved during the mapping, assessment and recommendation stages of the B-ITAAM. Figure 5.13 illustrates the IT service profiling technique, which is developed by the researcher to profile IT services.

IT Service Profiling		
IT service name:	Date:	Version no:
IT service description:		
IT application name:	IT service cost:	
Used application components:	Unused application components:	
IT technical infrastructure:	Technical specifications required to consume the service:	

Figure 5.13: IT service profiling

For each IT service, an IT application is packaged with its components and corresponding technical IT infrastructure. Used application components refer to the units of functionality of an IT application that are currently active with regards to delivering IT support to related business services. Unused components, however, refer to the units of functionality of an IT application that are inactive for any reason – these can be technical or non-technical in nature. The assessment of IT alignment is then directed to those active components to enable recommendations to be appropriately tailored. The detailed information about application components can be provided by IT managers, so it is helpful to be aware of the IT application components that are currently adding value compared with the ones that are inactive within the same IT application. The cost of an IT service is also documented, referring to the total cost of the acquisition, operation, maintenance and changing costs that might be incurred for each of the computing elements associated with the IT service. The technical specifications that are required in the machines to consume the IT service are also considered to ensure whether these specifications are still applicable for any future enhancements that might be recommended to IT applications.

A set of business and IT service profiles are the outputs of the comprehensive analysis of the operational level of an organisation that is carried out in the second stage of the B-ITAAM. These profiles hold crucial information about business and IT capabilities in the organisation, which will facilitate the mapping, assessment and recommendation of business-aligned IT services in the following stages of analysis.

5.4 Stage 3: Mapping and Analysis of Relative Benefits of IT

The set of profiled business and IT services in the previous stage are used as inputs in this stage of analysis, where these services are mapped through IS services to establish their alignment assessment. The level of strength of resultant mappings is then determined through analysis of a set of tangible and intangible factors. These factors are analysed through a set of business analysis techniques that are defined at this stage to support the assessment of the fit of business-aligned IT services. The mapping of business and IT services is discussed first in this stage, followed by a discussion of the analysis of the relative benefits of IT services to aligned business services.

5.4.1 Mapping of Business and IT Services through IS Services

The adoption of the principles of Service-Oriented Architecture and Enterprise Architecture in this research has laid the groundwork for the introduction of Information Systems Services (ISS) to map each Business Service (BS) with an IT Service (ITS) that is expected to add value to customers (Wout et al., 2010). Each BS consists of one or more Business Processes (BPs). Likewise, each ITS (i.e. IT application) consists of one or more IT Application Components (ITACs) (i.e. the components that perform application functionalities) (see Figure 5.14).

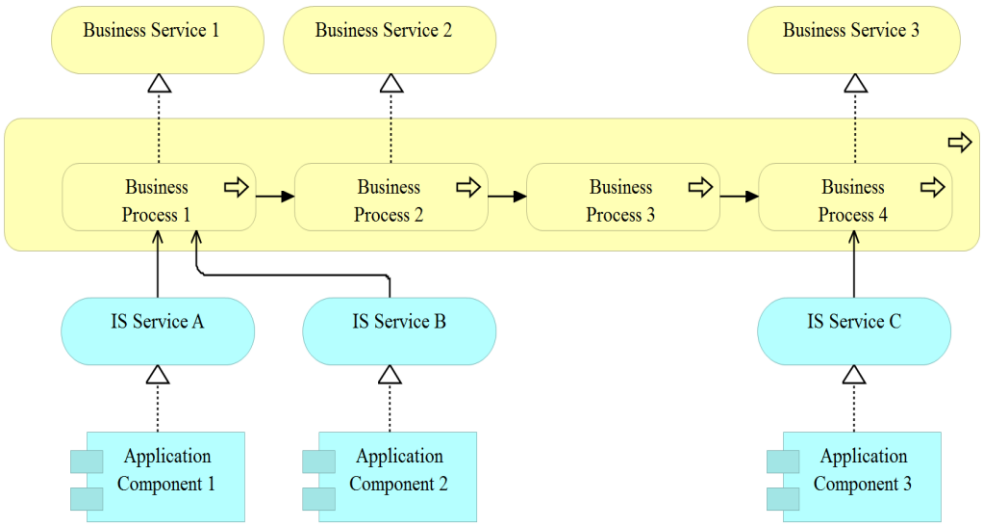

Figure 5.14: An illustration of possible relationships between business processes and supporting IT components (adapted from The Open Group, 2017)

Establishing the alignment between a business service and an IT service through an IS service enables the structure of the 'business-aligned IT service' to be formed. This allows for a further rational alignment assessment to be carried out for each pair that consists of

(BS:ISS:ITS). However, different complex scenarios of business and IT alignment can result, as illustrated in Figure 5.15.

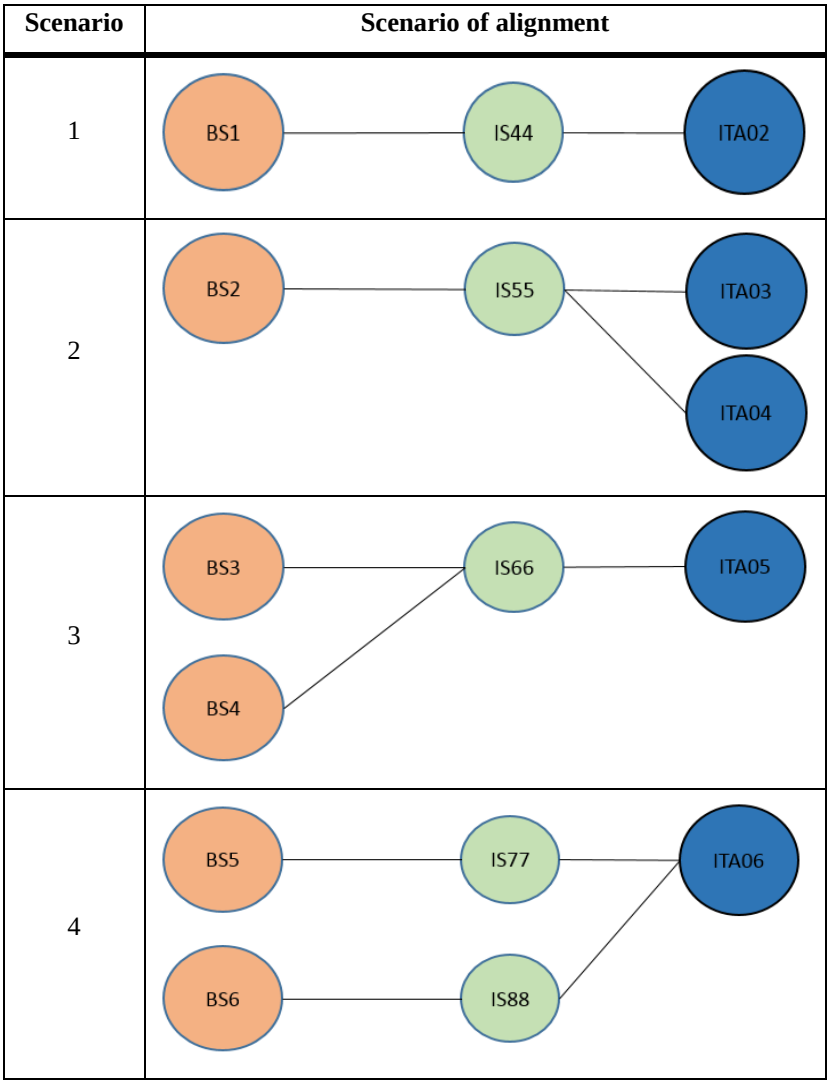

Figure 5.15: Multiple scenarios of business and IT alignment through IS services

The **first** scenario of alignment is one-to-one pairing, where one business service is aligned to one IT service through one IS service. In this scenario, ITACs performing application functionalities to support business processes are only from one IT application. The **second** scenario is one-to-many, where one business service is aligned to many IT services through one IS service. In this scenario, ITACs from multiple IT applications are collaborating to support a business service. The **third** scenario is also one-to-many pairing, but in this case one IT service is aligned to many business services through one IS service. This leads to another **fourth** unique scenario, which is also one-to-many pairing, but, in this case, one IT service is aligned to many business services through multiple IS services.

In this research, the physical boundaries between ITACs supporting business processes are not taken into account and therefore from now onward an ITAC is treated as an IT service

that groups IT capabilities from one or more ITACs to support one or more business processes. This ITAC must reach a standard level of competence in order to effectively support business requirements. This approach helps to treat large IT applications such as Blackboard as an IT application that consists of number of ITACs that serve multiple business services, where individual components can be assessed independently for enhancement, maintenance or removal based on its relative benefit value that is going to be analysed in the next step.

5.4.2 Analysis of Relative Benefits of IT

Once business and IT services are mapped through IS services, the assessment of the quality of resultant mappings can be established through the evaluation of the relative benefits that IT services bring to aligned business services, and also through the quality of the business services themselves in terms of their efficiency and effectiveness. This quality of business services is discussed in the last stage of the B-ITAAM. The relative benefit value of an IT service, however, can be calculated through analysis of a number of factors that include:

- Users' perceptions of an IT application component to support related business service.
- The technical quality of an IT application.
- Business financial gains acquired from an IT application usage.
- Usage pattern of an IT application component.
- The level of criticality of an IS service that maps each business service with a corresponding IT service. This factor has been previously discussed in Section 5.3.1.5.

The analysis outcomes from all of these factors for each mapping are then combined at the end of this stage to produce a single relative benefit value for each business-aligned IT service.

5.4.2.1 Users' Perceptions towards IT Application Components

Users' perceptions of the usability and usefulness of IT application components to support related business services is an important social factor that aids realisation of how beneficial an IT solution is to the organisation. Users of an IT application usually interact with a user interface that makes the functionality of the IT application available to them. However, behind this interface is a number of IT Application Components (ITACs) that can be

assessed from users' perspectives to determine which components outperform others in a single IT application. This is especially useful when an IT application consists of many ITACs serving multiple business services. Recommendations for enhancement or abandonment can then be drawn and tailored as per an ITAC instead of the whole IT application.

The analysis of users' perceptions is carried out following the valuation framing technique (discussed in Section 2.3.5). Figure 5.16 shows the users perceptions' analysis technique, which consists of a set of criteria that have been extracted from multiple sources including Hall (1959), Moore and Benbasat (1991), Gibson et al. (2008) and John (2015). These criteria focus on assessing the usefulness, ease of use and overall satisfaction of an IT application component to support users' related tasks.

Users' perceptions of an IT component						
IT component name:		Business service name:			Date:	Version No:
No.	Assessment criteria	CW / UW	User1	…	…	User n
			0.00	0.00	0.00	0.00
1	The IT component fits well with the user style or mode	0.00				
2	The IT component enables the user to accomplish relevant task(s) more quickly	0.00				
3	The IT component is easy to use	0.00				
4	The IT component ensures equal opportunity for all users	0.00				
5	The IT component improves communications with other relevant stakeholders	0.00				
6	User's information is kept confidential throughout the use of the IT component	0.00				
7	The IT component is compatible with all the aspects of the user's task(s)	0.00				
8	It becomes more interesting to use the IT component in the execution of relevant task(s)	0.00				
9	It is easy for the user to become more skilful in using the IT component in executing relevant task(s)	0.00				
10	The IT component is capable to provide appropriate support when problems arise and need prompt solutions	0.00				
11	I am totally satisfied with the use of this component to support my business activities	0.00				
$V_i = \left(\sum_{j=1}^{11} uv_j \times cw_j\right) \times uw_i$ *						
$UPV = 1 + \left(\sum_{i=1}^{n} V_i - LV\right) \times \frac{(5-1)}{(HV-LV)}$ **						

Figure 5.16: Users' perceptions value assessment

**V_i: a total rated value for each user; uv_j: user perceived value ranging from totally disagree (-3) to totally agree (3); cw_j: a weight assigned to a criterion; uw_i: a weight assigned to a user.*
***UPV: User Perceived Value; LV: the lowest value of v; HV: the highest value of v.*
Note: HV should not equal LV in this assessment, but when $HV = LV$ then $UPV = HV = LV$

Each of these criteria is given a weighting value by an authoritative business or IS manager that indicates its importance to the business service. Stakeholders who have been identified as the main users of an IT application component through related business service profiles and in the IT repository are targeted in this analysis. Weighting values are assigned to these stakeholders to determine their level of power in influencing the value of the IT component. The assignment of these values can be determined by the evaluator and then negotiated, adjusted and approved by key business or IT stakeholders.

Following the valuation framing technique, each user is going to evaluate an IT application component through the set of defined criteria in Figure 5.16. In this sense, a value from totally disagree (-3) to totally agree (3) is provided by the user for each criterion, with 3 being the highest value given to indicate the total agreement with the criterion that is presented to reflect on the effectiveness of the IT component to support related business service. The total perceived value of users (i.e. UPV) is then calculated and transformed into a scale from 1-5 through the equations illustrated at the bottom of Figure 5.16. The guide in Figure 5.17 is applied to determine the outcomes of this users' perceived value assessment.

Min	Max	Percentage	UPV
4	5	>= 80%	H
3.25	3.99	>= 65% - < 80%	M
1	3.24	< 65%	L

Figure 5.17: Guide for determining users' perceived value of an IT component

Perceptions about the severity impacts on the organisation from the failure of an IT application as perceived by key authoritative stakeholders

In a sub-analysis, the severity impacts on the organisation from the failure of an IT application as perceived by the application owners is assessed. The value results from this assessment is not directly involved in the calculation of the business value from IT in B-ITAAM. However, it provides another dimension for realising how critical an IT resource is to the organisation and what impact it will have on the organisation once it fails to perform as required. This provides useful information when an IT application or its components are to be recommended for enhancement or abandonment.

The level of severity impacts on the organisation from the failure of an IT application can be classified as either "severe impact", "medium impact" or "no impact" (Tareen, 2014, pp.16-17). Severe impact refers to the widespread business stoppage and damage that affects current and future revenues, reputation and customer satisfaction. Medium impact refers to the indirect impact on an organisation's revenues, reputation and customer satisfaction. Moderate productivity degradation is an example of such medium impact from the failure of

an IT application. The “no impact” category denotes that there is no impact on the organisational operation, productivity, reputation, revenues and customer satisfaction. Key authoritative stakeholders from business and IT departments can provide inputs about the severity impact value indicating how critical an IT resource is to the organisation.

5.4.2.2 Technical Quality of IT Applications

The quality of IT resources deployed at the operational level of an organisation determines the organisation’s approach of creating business value through its business and IT strategies (Bradley et al., 2011). One of the angles to determine the quality of deployed IT resources is the quality of its technical capabilities. For IT applications, the technical quality (ITQ) can be assessed based on ISO standard (ISO-9126, 1991), which defines a set of criteria for measuring the internal and external quality of IT applications. It is also a business-independent assessment and the senior technical team from the IT department should be capable of assessing these capabilities through a defined set of criteria that includes:

- **Functionality**: the functionality of the IT application to meet the requirements specified by the business service.
- **Maintainability:** the ability of the IT application to sustain stability during modifications to its functional requirements.
- **Scalability:** the ability of the IT to handle the rapid increase of a task in a stable manner.
- **Reliability:** the ability of the IT to maintain the specified level of performance during stable and unstable conditions.
- **Usability:** the applicability of the IT to completely fulfil the needs of the business service in a simple instructed manner.
- **Extensibility:** the capacity of the IT to extend its capabilities to accommodate new business requirements.
- **Adaptability:** the ability of the IT to adapt its behaviour to different specified environments.
- **Interoperability:** the ability of the IT to interact with other IT applications or systems.
- **Response time:** the time it takes for the IT application to respond to functional changes.

Based on this set of criteria and following the principles of the valuation framing technique, the senior technical team is going to evaluate each IT application under assessment in terms of its technical capability. The resultant value from this ITQ assessment is then transformed into a scale from 1-5, with 5 indicating the highest value that an IT application can score, referring to its excellent technical competency. IT applications that score 4 and above in this analysis are considered to have a good technical quality, whereas IT applications that score 3.25 and below should be considered for major technical enhancements that may extend to IT infrastructure including network, storage, etc. For applications that score in between 3.25 to 3.99, they are considered to have an acceptable level of technical capability but further enhancements to some critical technical aspects that were low in the assessment should be immediately carried out by the technical team.

In a related sub-analysis, the technical team is going to provide feedback about the criticality of each technical capability mentioned above in regard to its importance to the business based on their understanding of business strategies and requirements. The criticality of each capability is measured on a scale from 1-5, with 5 indicating that the technical capability is highly critical to the running of the business. The total criticality level of one technical capability is then calculated based on the reoccurring responses for it by technical team members. This sub-analysis aims to not only shed light on the level of criticality of each technical aspect as perceived by the technical team according to their understanding of business strategies, but also to shed some light on the level of harmony between business and IT departments. Technical aspects that are classified as highly critical by the technical team and at the same time receive a low value in the technical quality assessment should be dealt with promptly. This is because this issue may extend to users' perceptions about the IT service and eventually affect the quality of the level of alignment between business and IT.

The value derived from this technical quality assessment is assigned to all involved components within an IT application. This is primarily because components within a single IT application usually share the same IT infrastructure.

5.4.2.3 Business Financial Gains Acquired from IT Application Usage

The financial perspective is another dimension that has received attention in the IT literature to determine the relative benefit of deployed IT applications in organisations. Financial Gains (FG) acquired from IT applications can be measured through the benefits that an organisation obtains from the effective utilisation of embraced IT solutions to support business services. The FG value in this analysis is determined at an IT application level,

which highlights the return of investment of IT resources. A set of criteria elicited from Seddon et al. (2002) are used to determine this value, which include:

- **Reduce time for completing tasks per employee:** the time saved in performing business activities is interpreted as saved cost.
- **Reduce number of employees:** the labour cost saved from the adoption of an IT application to efficiently perform the business service is interpreted as saved cost.
- **Increase velocity:** in a specific time, the increased performance of a business function is calculated in terms of speed and volume.
- **Increase end user level of satisfaction:** an increase in end user levels of satisfaction through the adoption of an IT solution. This can result in building more user loyalty and eventually more profit (Hallowell, 1996).
- **Increase innovation in business towards business growth:** the ability of IT resources to enable business service innovation to increase organisational profit or maintain stakeholders' satisfaction.

Figure 5.18 shows the analysis technique that is developed in B-ITAAM to determine the FG acquired from the utilisation of IT applications.

Financial Gains Analysis				
IT application name:	Date:	Version No:		
Assessment criteria		Criteria weight	Value	Percentage achieved
Reduce time for completing tasks per employee				
Reduce number of employees towards labour cost				
Increase velocity in achieving assigned tasks				
Increase end user level of satisfaction				
Increase innovation for business growth				
Financial gains value = $\sum Criteria\ weight * Value =$				

Figure 5.18: Financial gains analysis

The calculation of the FG value involves the adoption of a weighting principle. In this, the set of assessment criteria for determining the FG are assigned weighting values by a senior IS/IT manager who is the most suitable person to assess the effectiveness of IT investments made by an organisation (Seddon et al., 2002). The higher the weighting value given to a criterion, the more priority is allocated to it in determining the FG value. The total weighting value of the set of five criteria shown in Figure 5.18 should equal 1. The IS/IT manager will then provide more information about each of these criteria as to whether it has been met, partially met or not met at all. For criteria that have been met, they are assigned a value of 1; criteria that have been partially met or not met are assigned values of 0.5 and 0, respectively.

The percentage achieved refers to a rough estimated value that is provided by an IS/IT manager to indicate the level of achievement that a criterion has reached to satisfy a financial gain as specified in the organisation's strategic plans. Although this value is not considered in the calculation of the FG value, it provides an overview of the criteria that have contributed the most to the return of investment of IT resources. Thus, more efforts have to be placed on those criteria that an IT resource is only contributing less towards achieving financial gains. The FG values resulting from this analysis technique for each IT application are then converted into a scale from 1 to 5 and combined with other derived values to determine the relative benefits of IT applications aligned with business services.

5.4.2.4 Usage Pattern of an IT Application Component

The usage pattern of an IT application component (ITU) is a relevant tangible factor that influences the value of business and IT alignment. A high level of usage of an IT application component, supported by positive perceptions from its users about its capability to support related business service(s), can provide a strong indication of the good fit of this component in the business. However, it is difficult to measure the exact level of usage of IT components. Nonetheless, the usage frequency of such components by targeted users can help with measuring the level of usage of IT components in the organisation (Davis, 1989). This analysis in the B-ITAAM is applied at a component level to determine the components within an IT application that are being more frequently used in comparison to others.

The number of users and the duration spent on using an IT application component can determine how frequently a component is being used. The larger the number of users, the higher the importance of the IT component to support business offerings. Therefore, real-time data about the usage pattern of IT application components in particular, or IT applications in general, can be provided by IT professionals through a real number of active users at a given time. The number of IS capabilities that an IT application supports provides another indirect indication of the usage pattern of an IT application. From a subjective point of view and on a scale from 1-5, with 5 indicating high level of usability, the level of usage of IT application components can be assigned by key IT professionals. Key business stakeholders who are directly affected by the usage pattern of an IT component can also participate in assigning such values.

Up to this stage of analysis, each business service is mapped to a corresponding IT service through an IS service. The relative benefit analysis of IT services to aligned business services is also carried out through the set of business analysis tools that are introduced in this section.

The last step in this stage of analysis is the derivation of a single relative benefit value for each mapping initiated, which is discussed in the next section.

5.4.3 Relative Benefit Aggregated Value

For each mapping formed at the beginning of this stage and analysed through the relative benefit analysis that is accomplished in the previous step, a single value that reflects on the quality of the link between each business service and its supporting IT component is derived as a Relative_Benefit (R_B) value. So the total *R_B* value for each mapping comprises the relative benefit values of users' perceptions towards IT (*UPV*), the technical quality of an IT application (*ITQ*), the business financial gains from IT application usage (*FG*), IT usage (*ITU*) and the IS criticality to the business (*ISCB*). The following equation is used to calculate the total *R_B* value, which is adopted from the Social Exchange Theory (Whitten and Wakefield, 2006, Emerson, 1976) and adapted from the work of Sun et al. (2014). In this equation, for a given business-aligned IT service through an IS service, a total *R_B* value is calculated through the aggregation of tangible and intangible factors as follows:

$$Total\_Relative\_Benefit_i = UPV_i + ITQ_i + FG_i + ITU_i + ISCB_i$$

Relative_Benefit (R_B) value involves:

UPV_i: the perceived value of an $ITAC$ to support a BS;

ITQ_i: the technical quality of an IT application ITA;

FG_i: financial gains from using an ITA to add value to a BS;

ITU_i: $ITAC$ usage pattern;

$ISCB_i$: the criticality of the IS service that maps an $ITAC$ to a BS;

Due to the analysis of different tangible and intangible factors that include both numerical and non-numerical data, intangible values are transformed into a scale from 1-5. This is achieved through the adoption of the linear equation:

$$y = 1 + (x - Vmin) * \frac{5 - 1}{(Vmax - Vmin)}$$

In this equation, y refers to the relative value between 1 and 5. $Vmin, Vmax$ refer to the lowest and highest values in the data set, respectively. X, on the other hand, refers to the value within the range of $Vmin$ ... $Vmax$. When $Vmin = Vmax$, then $y = Vmin = Vmax$.

The calculated *R_B* value represents the relative benefit of a single pairing that consists of an IT application component with a business service. The resultant *R_B* value is then a value that ranges from 1 to 5, which is classified into three main categories as High (H), Medium (M) or Low (L) as shown in Figure 5.19.

Min	Max	Percentage	R_B value
4	5	>= 80%	H
3.25	3.99	>= 65% - < 80%	M
1	3.24	< 65%	L

Figure 5.19: Categorisation scheme for the relative benefit values

The classification of the R_B value into three categories serves as a mechanism that enables the identification of the quality and the status of each analysed IT application component with regards to supporting a related business service. In other words, the R_B value indicates the criticality of the mapping initiated at the beginning of this stage, allowing for further analysis to take place to enhance the level of alignment between business and IT. For an illustration of the purpose of this classification mechanism, an ITAC may score a high R_B value and, in this case, it is highly unlikely to be targeted for further enhancements as it is considered valuable to the business service through the outcomes of the analysis of the relative benefit factors. *High* then refers to a high level of benefits from an IT application component in terms of its *criticality to the business, its technical quality, level of usage among stakeholders, users' positive perceptions* and, finally, *the financial gains* acquired from the investment and deployment of the component into the business.

On the other hand, if a R_B value of an ITAC is resulted to be *Low*, it does not only indicate a poor level of alignment between a business service and its enabling IT component, but it also indicates that prompt enhancements to the ITAC should take place to ensure its effective support to related business services.

By the end of this stage of analysis, the set of business and IT services that are profiled in Stage 2 are mapped and evaluated for their alignment from a relative benefit point of view. This results in a single R_B value for each IT service mapped to a related business service. This value, which is an output at this stage, is then used as an input in the fourth and last stage of analysis in the B-ITAAM.

5.5 Stage 4: Evaluation and Recommendations of Business-Aligned IT Services and KPIs

This stage of analysis examines the impact of each of the business service values derived in the second stage on the Relative_Benefit (R_B) values of associated IT services that are produced at the end of the third stage. The purpose is to derive recommendations for optimising the set of analysed IT services while being aware of the performance of aligned business services. By the end of this stage, feedback is provided to the board of management

of an organisation on the operational performance of the analysed set of services through a KPIs monitoring analysis.

5.5.1 The Impact of Business Service Values on IT Services

Although the derived R_B values of IT services provide an indication of the level of criticality of the mapping initiated between each business service and its enabling IT application component, it is not sufficient to reflect on the business value of IT. This is because the performances of the business services themselves, which can significantly influence the value added by IT in an organisation, are not considered in the derived R_B values. Therefore, in an *IT_Impact_Analysis*, the business service values that have been previously determined and documented in related business service profiles are incorporated with R_B values to influence the recommendations on IT services.

These business service values include Business Service Strategic Value (BSSV), Perceived Business Service Performance (PBSP) value and Business Service Efficiency (BSE) value. The latest value (i.e. the BSE) provides concrete evidence to reinforce the value of the PBSP of a business service from its engaged stakeholders and they are therefore treated as a single value. So for a business service performance that is perceived to be low by its engaged stakeholders, a reflection on this low performance value might be seen in the BSE resulted value. If two extreme values arise for PBSP and BSE values, the BSE value is considered since it reflects on the business service performance from an objective point of view.

The outcomes from the *IT_Impact_Analysis* help to determine the impact of business services' performance on supporting IT services and also pave the way for recommendations to enhance the IT portfolio in an organisation. The *IT_Impact_Analysis* is carried out in three steps:

Step 1: determine the impact results for each IT application component through each pairing initiated, consisting of an IT application component, IS service and a business service.

Step 2: observe the holistic impact results on individual IT applications.

Step 3: propose recommendations for IT applications and IT application components.

Step 1: determine the impact results for each IT application component

The impact result for each IT application component is determined in this step through a set of algorithms that considers the following values as parameters: the Relative Benefit (R_B) value, Business Service Strategic Value (BSSV) and Perceived Business Service Performance (PBSP) value. This impact result is classified into five impact categories (i.e.

maintain, revise, replace, outsource and remove) as described in Table 5.1.

Table 5.1: Description of IT impact categories (adapted from Sun et al., 2014)

Category	Description
Maintain	An application component that is critically important to support business requirements and shows effective support to related business service based on examined set of factors
Revise	An application component that is supporting a highly strategic business service but requires further enhancements to fully support the service
Replace	An application component that is not adding value to business needs while deployed to support a highly strategic business service needs to be replaced with another application component either from the IT repository or from a vendor
Outsource	An application component that is utilised to support a non-core business service and can be alternatively outsourced for more reliability and more cost-effective IT solution
Remove	An application component that is deemed obsolete by business services

The set of algorithms that considers the parameters (R_B), (BSSV) and (PBSP) are described in Table 5.2.

Table 5.2: Criteria for decision-making for the impact analysis

Decision number	R_B	BSSV	PBSP	Impact result
1	H v M	H	H v M	Maintain
2	H	M	H	Maintain
3	H v M	L	H	Maintain[1]
4	H	M	M	Revise[2]
5	M	M	H	Revise[3]
6	L	H	H V M	Replace
7	L	M	H	Replace
8	H v M	L	H V M	Outsource[4]
9	L	M	M	Outsource
10	L	L	H V M	Remove

Note: R_B and PBSP scales: H: 4-5; M: 3.25-<4; L: 1-<3.25. BSSV scales mapped on as: H: 3, 5; M: 2, 4; L: 1.

1) High PBSP supported by objective high BSE enforced this decision, otherwise it can be outsourced if suitable as in decision (8).
2) Requires further business service efficiency evaluation and enhancements.
3) Requires further enhancements or evaluation to one or more of the R_B factors.
4) Requires further change analysis or it can just be maintained as in decision (3).

In this IT impact analysis, the three parameters (i.e. the R_B value, BSSV and PBSP) have impact on the final decision to be made for an IT application component. The R_B value is derived based on the set of tangible and intangible factors that are analysed in Stage 3, which highlights the relative benefits of IT application components in supporting related business services. Meanwhile, the BSSV is drawn from strategic perspectives, indicating the level of importance of a business service in an organisation. Finally, there is the PBSP value, which is derived through the perceptions of stakeholders involved in the business service. This as an intangible subjective value is supported by a tangible objective Business Service Efficiency (BSE) value to provide concrete evidence about the performance of a business service.

The impact results drawn in this step indicate only the impact on IT application components,

but not the impact on individual IT applications. This leads to the second step of the impact analysis where IT application components are grouped based on related IT applications.

Step 2: observe holistic impact results on individual IT applications

For a single IT application, multiple impact results can be observed for its components since one IT application is aligned to support multiple business services through multiple IT components. The impact results for IT application components are then grouped according to relevant IT applications. This provides a clear view of the capability of an IT application in terms of the performance of its involved components. This also enables proposed recommendations for IT applications to be drawn with full awareness of its different components' capability. However, it is highly unlikely that a single IT application will be removed unless, for example, all of its components show low impact results. Once the same impact result for IT components are derived within an IT application, it is a confirmation of the status and the suitability of the whole IT application to support business needs within an organisation.

A voting system or some other mechanism can then be developed by an organisation at this stage of analysis to assist with determining the final decision for an IT application once all of its components' impact results become visible. Such mechanism may need to consider multiple critical aspects from business and IT perspectives to propose a recommendation. Weighting values, for example, can be assigned to these critical aspects by key authoritative personnel at the organisation. So human interventions in such cases are mandatory to reach a final recommendation for an IT application.

In this research, however, two similar approaches are suggested to propose recommendations for IT applications based on the outcomes of their IT components impact results. However, these approaches also require human intervention to reach a final decision about an IT application. The first approach is *strategic oriented* and the other is *performance oriented*. An organisation can then choose the approach that suits it the most when making a decision for an IT application. This choice depends on whether the organisation is influenced by the level of criticality of the business service strategy or by the perceived performance of the business service. Both approaches apply priority rules mechanisms for deriving a single recommendation for IT applications and they are explained as follows:

First: deriving an IT application recommendation based on the strategic importance of related business services:

In this approach, the impact result for each IT application component is considered along

with the associated Business Service Strategic Value (BSSV) to derive a recommendation for an IT application. The priority rules are then applied as follows:

1. If one IT application component within an IT application has an impact result = *Maintain*, then a single impact result for the whole IT application is assigned *Maintain* regardless of other components' impact results and the values of the BSSV associated with them.
2. *BSSV = High* has higher priority than *BSSV = Medium*. This is because an IT application component is supporting a strategically more important business service. Therefore, an impact result with BSSV= High is chosen as the single application impact result.
3. Apply the most occurring impact result from the set of impact values.

Table 5.3 provides examples to illustrate the application of the priority rules.

Table 5.3: Examples of the application of the priority rules based on the BSSV to observe a holistic value for an IT application

Example of IT application impact results	**Decision**	**Why**
ITA10 = {ITAC1: **Maintain** (BSSV = M), ITAC2: Replace (BSSV = H), ITAC3: Remove (BSSV = L)}	Maintain	Rule 1
ITA11 = {ITAC4: Outsource (BSSV = M), ITAC5: Replace (**BSSV = H**), ITAC6: Outsource (BSSV = L)}	Replace	Rule 2
ITA12 = {ITAC7: **Outsource** (BSSV = L), ITAC8: **Outsource** (BSSV = M), ITAC9: Replace (BSSV = M), ITAC10: Remove (BSSV = L)}	Outsource	Rule 3
ITA13 = {ITAC11: **Replace** (BSSV = M), ITAC12: **Replace** (**BSSV = H**), ITAC13: Outsource (BSSV = M), ITAC14: Outsource (BSSV = L)}	Replace	Rule 2 and Rule 3
ITA14 = {ITAC15: Outsource (BSSV = M), ITAC16: Replace (BSSV = M)}	Requires human intervention or inclusion of other factors in the recommendation derivation process.	

Second: deriving an IT application recommendation based on the perceived performance of related business services:

In this approach, the impact result for each IT application component is taken into account along with the Perceived Business Service Performance value (PBSP) to reach a single recommendation for an IT application. The PBSP value in this context does not only provide an overview of how involved stakeholders perceive the business service, but also incorporates a tangible value that addresses the efficiency of the business service. Only High and Medium PBSP values are considered in this approach as Low PBSP indicates a very poor perception of the business service performance. The three priority rules mentioned above are also applicable in this approach. However, since PBSP values can be assigned

only High or Medium, the set of examples mentioned in Table 5.3 are not applicable in this situation and therefore a new set of examples is provided in Table 5.4 to illustrate the application of the priority rules based on the PBSP value.

Table 5.4: Examples of the application of the priority rules based on the PBSP value to observe a holistic value for an IT application

Example of IT application impact results	Decision	Why
ITA20 = {ITAC1: **Maintain** (PBSP = M), ITAC2: Replace (PBSP = H), ITAC3: Remove (PBSP = M)}	Maintain	Rule 1
ITA21 = {ITAC4: Outsource (PBSP = M), ITAC5: Replace (**PBSP = H**), ITAC6: Outsource (PBSP = M)}	Replace	Rule 2
ITA22 = {ITAC7: **Outsource** (PBSP = M), ITAC8: **Outsource** (PBSP = M), ITAC9: Replace (PBSP = M), ITAC10: Remove (PBSP = M)}	Outsource	Rule 3
ITA23 = {ITAC11: **Replace** (PBSP = M), ITAC12: **Replace** (**PBSP = H**), ITAC13: Outsource (PBSP = M), ITAC14: Remove (PBSP = M)}	Replace	Rule 2 and Rule 3
ITA24 = {ITAC15: Remove (PBSP = M), ITAC16: Replace (PBSP = M)}	Requires human intervention or inclusion of other factors in the recommendation derivation process.	

The impact results per individual IT applications are derived in this step of analysis, indicating the business value of IT applications. However, human interventions are still mandatory and cannot be avoided, especially in cases such as *ITA14* and *ITA24* in the examples provided above. The set of tangible and intangible factors analysed throughout the instantiation of the B-ITAAM should provide crucial facts that can be referred to once critical decisions about an IT application become challenging. Once IT application recommendations cannot be made or are impossible to apply, recommendations on individual IT application components should be considered as an alternative option.

Step 3: propose recommendations for IT applications and IT application components

Optimising IT applications in an organisation through a set of possible recommendations is a matter of making sure that these IT applications deliver business value (Kohli and Grover, 2008). The impact results for both IT applications and IT application components produced in the *IT Service Impact Analysis* in the previous steps allow for possible recommendations to be drawn. For an IT application or component as an (IT resource) with an impact result = *Revise*, it might only require some upgrades to fully support business needs. So the analysed set of factors related to business and IT aspects associated with this IT resource should be revised to determine the aspects that require further enhancements. The *Revise* value can also be based on poor performance of the business service itself, so business service efficiency and effectiveness should be revised in this case.

For IT applications or components with an impact result = *Replace*, it is possible to

recommend replacement by other existing IT solutions from within the IT repository. Otherwise, replacement with a new IT solution is an alternative option. The recommendation of *Outsourcing* is possible when the business service to be supported is not strategically critical to the organisation. This recommendation is also possible when the organisation is looking for a cost-effective solution. However, other changing cost factors have to be considered before this recommendation can be proposed.

For the last two possible recommendations, *Maintain* is the best possible recommendation to be proposed to an organisation's board of management as it is an indication of the effectiveness of the IT solution in supporting related business requirements. On the other hand, *Remove* is the worst, indicating that an IT solution is not adding value to the business and it is therefore deemed obsolete.

It is still vague up to this step of analysis whether or not to propose a recommendation to an IT application or an IT application component since the impact of applying derived recommendations on the organisation are still not obvious. Therefore, change management has to be considered as a critical part in the decision-making process, which is discussed in the next section.

5.5.2 Business Service and IT Service Change Management

The deep analysis of business and IT services conducted through multiple business analysis techniques defined in the B-ITAAM provides a holistic view of the operational competency of an organisation. This enables recommendations for possible enhancements for the set of analysed business and IT services. Changes to IT solutions, whether applications or components, are sensible when they are based on value-adding to the business. This is analysed through the relative benefits of IT solutions to the business. However, financial implications to the organisation from applying the proposed changes is another factor that cannot be neglected. The cash capacity to change based on a proposed recommendation for an IT solution has to be verified first before the recommendation can be accepted. The scope of the change in terms of its depth and breadth must also be determined, along with the flexibility of an IT application to accommodate the changes that are proposed.

On the other hand, changes can extend to business services; more specifically, the business processes that are realised within each business service. In some scenarios, an IT application component may show a high relative benefit value to its related business service and yet it is recommended that it should be revised. This is because subjective and objective values of business processes are indicating low or medium business service performance. Possible

recommendations or changes based on best business process designing practices can then be proposed in order to enhance the performance of poor business processes. These recommendations may include increasing resources or performing some tasks in parallel, etc. So, the scope of the change in terms of its depth and breadth must be carefully considered in relation to the business services.

Proposed recommendations to change business and IT aspects should be guided by strategic objectives and follow organisational norms that have already been established by the organisation. As previously highlighted, human intervention is required since changes to business and IT services may not only interrupt business operations but may also incur large costs. Final proposed recommendations should then be documented in the business context analysis and shared with the decision-makers of an organisation to support informed decision-making. The comprehensive analysis of business and IT services carried out through the B-ITAAM is guided by a set KPIs and this helps in the derivation of sensible feedback on the aspects that cause violation to these KPIs' desired values. This is discussed in the next step.

5.5.3 Feedback on Analysed set of KPIs

Key Performance Indicators (KPIs) are mapped to business services in Stage 1, with a view to tracking the performance of these services through defined set of metrics. According to Mateski et al. (2012), it is unlikely that a single metric can tell the whole story about the operational performance and, therefore, multiple metrics are usually needed from different perspectives. This then leads to the exploitation of the outcomes of the business analysis techniques that are defined in B-ITAAM so as to provide another real-time dimension to monitor KPIs, which complements other existing metrics that might have already been defined by an organisation.

Some of the business analysis tools defined in the B-ITAAM are focused on evaluating the daily performance of business and IT services and they are, therefore, implicitly measuring performances against related KPIs. For instance, the Business Service Efficiency (BSE), Perceived Business Service Performance (PBSP) and Users' Perceived Value (UPV) are business analysis techniques that provide valuable information about the daily performance of related business and IT services. BSE examines, from an objective point of view, whether the business service is being delivered according to defined rules and within a specified time-frame and allocated resources. PBSP examines the perceptions of involved stakeholders towards the performance of the business service and this provides an indication of the current

level of the business service performance from an intangible perspective. Both BSE and PBSP values complement each other and they can be closely observed to determine whether subjective or objective perspective factors are causing a violation of the KPIs' desired values.

Another factor that may also influence the operational performance – and therefore contribute to the violation of KPIs – is the UPV, which provides an impression from an intangible perspective of the perceptions of users towards the usability and usefulness of an IT application component for supporting related business service. This value can positively or negatively affect the performance of the business service itself. The BSE, for example, can be negatively affected by a low perceived value of supporting IT application component. Optimal values in these three factors should contribute and influence a positive value for a realised KPI. This then enables feedback on KPIs to be drawn and communicated to the management board of an organisation by specifying the violating operational aspects of KPIs.

By the end of this stage of analysis, not only are recommendations for the analysed set of business-aligned IT services proposed, but feedback on KPIs' violating aspects is also provided. These proposed recommendations and feedback are documented in the Business Context Analysis, indicating the end of the B-ITAAM cycle.

5.6 Summary

This chapter addresses the second and third research questions. In addressing the second research question, a methodology (i.e. B-ITAAM) for facilitating the evaluation of business and IT alignment at the operational level of an organisation is successfully introduced. B-ITAAM consists of fourteen business analysis techniques that are formed to establish and evaluate the alignment between business operations and supporting IT resources in a service-oriented manner. These techniques, for simplicity, are grouped into four interrelated stages working together as a mechanism to address different angles of business and IT alignment analysis and assessment.

The first stage examines the strategic level of an organisation and its current capabilities and guides the operational business and IT analysis in the second stage through a derived set of KPIs that are mapped to related business services. The mapped set of business services and their supporting IT services are then individually analysed and profiled in the second stage, allowing for a comprehensive understanding of these services and their capabilities. This then triggers the third stage of analysis where business and IT services are mapped through

IS services and these mappings are evaluated through five tangible and intangible factors (identified in the previous chapter) to determine the relative benefit values of IT services to mapped business services. The concepts and principles that have been adopted and adapted from strategic management, Enterprise Architecture, Service-Oriented Architecture and business IT alignment are reflected on the devised set of techniques in B-ITAAM. This allows B-ITAAM to decompose business and IT services into smaller constituent parts and then re-compose them through IS services to enable effective assessment of their alignment.

The resultant values from the third stage are then used as inputs in the fourth stage of analysis. In this last stage, these values are incorporated with business service values that are analysed in the second stage to determine the impact of business service performance on the value of IT through a set of defined algorithms. The outcomes from this stage pave the way for recommendations for enhancing the analysed set of business and IT services, and also for providing feedback about the operational performance of the organisation in relation to its defined strategic goals. So in addressing the third research question, the derivation of sensible recommendations to feed back to business improvements based on the evaluation outcomes is extensively discussed in this chapter. B-ITAAM then enables organisations to not only make informed decisions about the analysed set of business and IT services, but also to monitor the performance of these services against defined goals and to specify the aspects that are violating optimal values of KPIs.

This chapter introduces B-ITAAM as a novel approach to comprehensively evaluate business and IT alignment at the operational level of an organisation. The application of this approach in a real-life case study is carried out in the next chapter.

Chapter 6
Applying B-ITAAM in a Case Study

This chapter instantiates the Business and IT Alignment Assessment Method (B-ITAAM) in a real-life case study that was carried out in Albaha University. The case study shows the relevance of the research problem and the capability of B-ITAAM to address it. An overview of the data collected for the case study is introduced first, followed by a detailed description of the B-ITAAM application.

6.1 Data Collected for the Case Study

Data for the case study is obtained from a variety of locations and sources from Albaha University. The main locations include the school of Computer Science and IT, the university management department, the information unit department, the library, IT centre, quality assurance department, student services department and the admission department. Therefore, multiple data collection techniques are used throughout the instantiation of B-ITAAM. Table 6.1 provides an overview of the techniques applied to collect data for the case study and the purpose of the collection of this data. The source of data and the sample size are also indicated, reflecting on the data that is used in B-ITAAM after filtering and processing out the data that is found not useful.

Table 6.1: An overview of data collected from Albaha University and the techniques applied to collect it

Technique	Why	Where / sample size
Review of official documents and reports	To review strategic aspects including vision, mission, Critical Success Factors (CSFs), strategies and objectives, and Performance Indicators (PIs)	Strategic planning documents, rules and regulations documents, annual reports, and assets reports
	To review historical and up to date information related to financial, structural, and regulatory aspects of the university	
	To determine business service strategic values of analysed set of business services	
	To determine the criticality level of IT support to business services	
	To review descriptions of offered business services, rules that govern their behaviour and time they should take to achieve goals	
	To create an IT repository documenting main specifications as well as cost drivers for IT applications	
Review of websites and white papers	To create and complete an IT repository	Official IT applications' websites and other relevant white papers

Semi structured interviews	To check for updates on strategic aspects & to confirm the identified and prioritised set of KPIs	The vice-president of the university who is also the head of the quality assurance department
	To determine business service strategic values of analysed set of business services (for services that could not be found in official documents)	Authoritative business service owners
	To determine the criticality level of IT support to business services (for those services that could not be determined through official documents)	Authoritative business service owners
	To assign weighting values for participants and criteria used in the assessment of business and IT performance as perceived by stakeholders	Authoritative business service owners/ IT managers
	To create an IT repository & to determine the used and unused components of IT applications	IT manager and IT staff
	To determine the level of usage of IT components	IT manager or related business service owner
	To determine real-time efficiency of business services	Business and IT managers/ programme coordinators and academic staff from the school of CS and IT
Informal interviews	To confirm unpublished facts about business and IT aspects at the university	Business and IT managers
Online pilot survey	To determine the level of satisfaction among students from the school of CS and IT towards the quality of provided academic and management services	94 responses from male students from the school of CS and IT
Questionnaires	To determine the performance of offered business services as perceived by students	379 responses from male students from the school of CS and IT
	To determine users' perceptions towards multiple IT application components used to support business services	291 responses from male students from the school of CS and IT
	To determine the severity impacts on the university from the failure of IT applications as perceived by decision-makers	Authoritative business and IT stakeholders
	To determine the technical quality of IT applications	IT technical managers and IT technical staff
	To determine business financial gains acquired from IT application usage	Information systems manager

The large volume of data collected from Albaha University shows the enormous support that was given by the university in general and the school of Computer Science and IT, in particular, to carry out this case study. The following sections demonstrate through this data the instantiation of B-ITAAM in four stages of analysis.

6.2 Stage 1: Strategic and Business Context Analysis of Albaha University

This stage of analysis aims to analyse the business context of Albaha University from a strategic perspective. This will lead to a clear view of the university's current capabilities

and will also highlight the area of priority that has to be immediately monitored through the capability of the B-ITAAM. A strategic issue of concern for the university then emerges from the analysis, along with a list of KPIs that are mapped to related business services to guide the business and IT alignment and its assessment in the following stages of analysis. This stage is further divided into two sub-stages as follows.

6.2.1 Stage 1_A: Strategic Analysis of Albaha University

The strategic analysis of Albaha University aims to analyse the vision, mission and the business and IT strategies of the university in order to derive a list of KPIs that is of high importance to the university's success. At Albaha University, a list of Performance Indicators (PIs) is already defined in its strategic documents. However, this list is outdated and therefore the derivation of an updated list is undertaken by the researcher following the PIs derivation technique that is discussed in Section 5.2.1. During the derivation and documentation of the PIs at Albaha University, the vision, mission, CSFs, strategies and the list of PIs are all retrieved from the university's official strategic documents. They are then checked for updates and accordingly modified with the vice-president of the university, who is also the head of the quality assurance department, through a semi-structured interview to ensure that these strategic aspects are still relevant to today's mission and vision of the university. 78 PIs are documented as a list of PIs that the university currently has to monitor its operational performance against its strategies (see Figure 6.1).

Performance Indicators Derivation						
Organisation name: Albaha University			Date: September 2016		Version No: 1	
Vision	Mission	Strategic objectives	CSFs	Strategies	Performance Indicators (PIs)	
To take the lead in delivering academic programs and conducting research in fields relevant to regional resources and national needs through leadership, innovation, and partnership	To provide distinguished and comprehensive higher education, research, community service and lifelong learning environment through the utilization of available resources to ensure the best results	To take the lead in academic and scientific excellence.	To be able to maintain and enhance academic excellence.	Enhance quality of teaching and learning.	PI1. Number of accredited majors by the National Centre for Academic Accreditation and Assessment. PI2. Quality of academic staff. PI3. Ratio of students to academic staff. PI4. Ratio of successful to unsuccessful completion. PI5. Employment rate of graduates. PI6. Students' satisfaction with the quality of teaching and learning. PI7. Number of teaching quality awareness workshops held at the university. PI8. Number of teaching quality excellence awarded certificates. PI9. Number of teaching quality experts at the university. PI10. Number of regional and international teaching quality awards. PI11. Number of national and international awards per academic staff. PI12. Number of sponsored academic staff who are studying higher degrees abroad. PI13. Number of collaboration relationships with international advanced institutions.	PI14. Students' satisfaction about academic support. PI15. Number of patents that academic staff have. PI16. Academic staff satisfaction about teaching environment. PI17. Number of workshops, conferences and training sessions that academic staff participated in. PI18. Ratio of conferences attended per academic staff. PI19. Ratio of teaching load per academic staff. PI20. Number of innovative proposed projects by academic staff. PI21. Number of publications that are accepted in high impact factor journals. PI22. Students' satisfaction with provided academic and management services. PI23. Number of academic staff promotions. PI24. Academic staff dropout rate. PI25. Quality of employees. PI26. Ratio of employees to academic staff per school.
				Enhance existing infrastructure and facilities	PI27. Completion rate of new campus project. PI28. Completion rate of internet availability project on different campuses. PI29. Academic staff satisfaction about existing facilities. PI30. Students' satisfaction about existing facilities. PI31. Employees' satisfaction about existing facilities. PI32. Academic staff satisfaction about library services.	PI33. Students' satisfaction about library services. PI34. Number of local and international databases and libraries that university students and academic staff have access to. PI35. Number of specialised libraries at the university in all campuses. PI36. Number of food hubs per campus. PI37. Stakeholders' satisfaction about maintenance of facilities. PI38. Speed rate in response to maintenance issues.
				Enhance regional and global ranking.	PI39. Worldwide ranking.	PI40. Local ranking.
		Enhance specialised research.	To be able to improve specialised research.	Enhance academic staff capabilities.	PI2. Quality of academic staff. PI41. Academic staff performance PI42. Number of training hours per academic staff.	PI11. Number of national and international awards per academic staff. PI43. Number of published work per academic staff.
				Specialised research	PI12. Number of sponsored academic staff who are studying higher degrees abroad. PI13. Number of collaboration relationships with international advanced institutions.	PI21. Number of publications that are accepted in high impact factor journals.
				Fund research	PI44. Number of completed funded projects/ research. PI45. Budget allocated to enhance research facilities including labs, materials and facilities. PI46. Number of funded research by organisations, companies, businessmen or businesswomen.	PI47. Number of specialised research linked to regional resources. PI48. Number of translated books and research articles.
				Encouraging continuous learning in PG courses	PI49. Number of enrolled PG research Students. PI32. Academic staff satisfaction about library services.	PI33. Students' satisfaction about library services.
		Provide community services.	To be able to offer Community services	Link university programs with the community needs	PI50. Number of provided programs, workshops linked to community needs. PI51. Relevant stakeholders' satisfaction about provided programs/ workshops.	PI52. Number of completed projects/ field projects by academic staff that have benefited local community. PI53. Number of consultancy projects carried out by academic staff.
				Build partnership relationships with local market	PI54. Number of partnerships with local employers. PI55. Partners level of satisfaction about partnership relationship with the university.	PI56. Percentage of employed graduates in local market. PI57. Unemployment rate after 6 months from graduation.
		Adopting E-University concept.	To be able to embrace E-University notion	Develop an e-learning environment that allows distance-learning	PI58. Number of e-services available to students and academic staff. PI59. Number of IT specialists and engineers contracted with in last 12 months. PI60. Number of outstanding academic staff contracted with in last 12 months. PI61. Number of e-courses and e-services available for different needs and different community groups.	PI62. Rate of e-learning trained staff. PI63. Ratio of students who are engaged in e-courses from students' population. PI64. Number of completed e-learning training sessions per academic staff.
				Enhance Information Technology infrastructure and capabilities	PI65. Budget allocated to enhance e-learning environment. PI66. Academic staff satisfaction about existing IT capabilities. PI67. Students' satisfaction about existing IT capabilities. PI68. Relevant stakeholders' satisfaction about IT maintenance and IT supporting services.	PI69. Efficiency of existing ERP modules to meet business needs. PI70. Number of PCs provided to academic staff, researchers and administrators. PI32. Academic staff satisfaction about library services. PI33. Students' satisfaction about library services.
		Provide lifelong learning environment.	To be able to offer lifelong learning environment	Support ongoing learning initiative	PI71. Number of ongoing learning awareness workshops. PI72. Number of conferences and symposia provided per year. PI73. Number of people or agencies who have benefited from offered programs/ workshops.	Rate of registered students in distance learning program. PI74. Relevant stakeholder's satisfaction about provided programs/ workshops. PI75. Relevant stakeholders' capabilities in using advanced technology.
				Build attractive learning environment	PI5. Employment rate of graduates. PI76. Salary range of graduates.	PI77. Number of small projects carried out by students after graduation. PI78. Relevant stakeholders' satisfaction about learning environment.

Figure 6.1: Performance indicators derivation and documentation at Albaha University

Among these derived PIs, there are some that are more important to the university than others and these are therefore prioritised as 'Key' Performance Indicators (KPIs). PI6 and PI22 are temporarily identified and prioritised in this study to be KPIs affecting key stakeholders of the university, namely the students. In collaboration with the vice-president of the university, the identification and prioritisation of these KPIs is confirmed, based on shared reports about the poor quality of provided academic and management services to the students of the school of Computer Science (CS) and Information Technology (IT), as perceived by the students themselves. There are some other PIs that are mentioned in Figure 6.1 which can also be seen to influence students' levels of satisfaction towards the quality of teaching and learning services, such as academic staff quality in PI2 and the ratio of students to academic staff in PI3. However, the focus is specifically put on KPI6 and KPI22 in this study to present this work in the B-ITAAM.

The reports that were shared with the vice president of the university that indicate the poor-quality services offered to the students of the school of CS and IT are based on two independent sets of questionnaires. First, an online pilot survey conducted by the researcher between the periods of January through April in 2015 reveals that the level of satisfaction among students from the school of CS and IT towards the quality of provided academic and management services is poor at only 54.8%. The survey is a double-blind translated questionnaire into Arabic language from the British Student National Survey. It consists of 31 questions and was undertaken by 94 undergraduate students (Appendix C).

Interestingly, the case study also uncovers that the level of satisfaction among students from the same school towards academic courses, programmes and studying experience is poor at only 42%. This second low confirming percentage is derived from a questionnaire that was designed and conducted by three academic professors from the school of CS and IT with support from the quality assurance department at Albaha University. The questionnaire was designed following the set of surveys provided by the National Commission for Academic Accreditation and Assessment (NCAAA) (Appendix E). The sample size was 530 students from the school of CS and IT. This low percentage not only confirms the pilot study outcomes of the unsatisfactory level among students towards the quality of provided core services, but also suggests that major improvements have to be made to enhance the quality of academic and management services if the university's strategic objectives and goals are to be met.

A theme of concern for the university based on these reports is then set and documented in the business context analysis as '*student satisfaction about teaching, learning and*

management services'. Along with relevant KPIs, this concern is the issue under investigation through the B-ITAAM. The analysis of business and IT services from an alignment perspective through the B-ITAAM not only supports existing measures to reflect on the performance of business operations, but also points out the aspects that specifically violate KPIs as either being business or IT driven.

The set of prioritised KPIs, as an output of the previous analysis technique, is then mapped to relevant primary teaching, learning and management services as shown in Figure 6.2. The mapping through this technique is restricted to business services that have supporting IT services to enable further business and IT alignment assessment to take place in a further stage of B-ITAAM. The assessment criteria of KPIs presented in Figure 6.2 are retrieved from the pilot survey that is conducted by the researcher in Appendix C to compare its outcomes against the outcomes of the B-ITAAM in the last stage of analysis.

Mapping KPIs to Relevant Business Services		
KPIs	Assessment Criteria	Business services that can be synced to this KPI for further alignment assessment
KPI6. Students' satisfaction with the quality of teaching and learning.	- Good teaching. - Appropriate assessment. - Quality of academic support. - Organisation and management. - Quality of learning resources. - Emphasising independent learning. - Course content and structure. - Course delivery.	BS4. Module content delivery. BS5. Assessment and feedback. BS6. Discussion and communication. BS12. Examination.
KPI22. Students' satisfaction with provided academic and management services.	- Welfare resources, services and facilities.	BS1. Admission. BS2. Module enrolment. BS3. Module withdrawal. BS7. Materials borrowing. BS8. Materials returning. BS9. Hold placing. BS10. Term deferral. BS11. Timetabling. BS13. Attendance monitoring. BS14. Academic record and certification.

Figure 6.2: List of KPIs mapped to core business services offered by Albaha University

The output of this sub-stage of analysis is a list of KPIs that is documented under one theme in the Business Context Analysis sheet to facilitate easy reporting to the management board of the university regarding how the school of CS and IT was performing in core students' services. Another output of this sub-stage is the set of mapped business services that are going to be the focus of business and IT alignment analysis and assessment in the following stages of B-ITAAM. The next sub-stage of analysis shows the instantiation of the Business Context Analysis technique in Albaha University.

6.2.2 Stage 1_B: Business Context Analysis

Business Context Analysis (BCA) is a central analysis technique in the B-ITAAM and, along with the outputs of Stage 1_A, it provides a clear picture of the university's structure, capabilities and strategic orientation. It also acts as a pivotal guide for the operational assessment of business and IT alignment from a strategic perspective. Figure 6.3 shows the business and IT aspects that were captured and structured from Albaha University through the BCA technique.

Captured information includes facts about the university since its establishment until recent years, which are reviewed along with changing business and IT strategies to understand the main organisational aspects that shape the university as it looks today. The code of practice of the university is also reviewed to realise the rules around business services provided by the university and how they are being governed. Moreover, the university is also examined in terms of hierarchical structures and stakeholders so as to determine key decision-makers and key groups of individuals who may affect or can be affected by the university services. Finally, information about the university's financial status is elicited to determine its financial ability and performance. All these revisions and elicitations of business and IT information are carried out through content analyses of official strategic and operational documents, annual reports and also through two informal interviews with business and IT managers. The interviews were mainly conducted to confirm unpublished facts about business and IT aspects at the university.

Facts elicited, derived and documented about Albaha University in the BCA sheet are necessary in the following stages of B-ITAAM. These facts not only guide the business-aligned IT assessment through the set of KPIs that is mapped to related business services under one theme, but also ensure that the alignment assessment and recommendations are carried out in line with the university's rules, regulations and financial strength.

Business Context Analysis			
Organisation name: *Albaha University*	Date: *10 OCT 2016*		Version No: *1.0*
Organisational Aspects	**Document reference**	**Key aspects**	**Theme under assessment/ KPIs**
Description of the organisation	*BHU.36.2015* *BHU.37.2016*	*Background information*	***Theme:*** *Student satisfaction about teaching, learning and management services.* ***KPI6****. Students' satisfaction with*
Vision and mission	*BHU.SP 1-5*	*Message and ambitions*	
Critical Success Factors	*BHU.SP 1-5*	*Competences*	
Business strategy	*BHU.SP 1-5*	*Goals and objectives*	
IT strategy	*BHU.SP 1-5*	*IT plans*	
Code of practice	*BHU.Rules.2016*	*Rules and regulations*	

Historical facts	*BHU.36.2015*	*Foundation of the HEI; figures and facts*	*the quality of teaching and learning.* ***KPI22**. Students' satisfaction with provided academic and management services.*
Business structure			
Organisational structure	*BHU.36.2015* *BHU.37.2016*	*Power hierarchy*	
Strategic units	*BHU.37.2016*	*Key decision-makers*	
External stakeholders	*BHU.SP 1-5*	*External influence*	
Financial overview			
Statement of cash flows	*BHU.36.2015* *BHU.37.2016*	*Financial state*	
Income statement	*BHU.36.2015* *BHU.37.2016*	*Financial state*	
Statement of financial position	*BHU.36.2015* *BHU.37.2016*	*Financial performance*	
Recommendations and feedback			
Proposed recommendations to analysed business services			
Proposed recommendations to analysed IT services			
Feedback on KPIs			

Figure 6.3: Business context of Albaha University

Based on a financial analysis performed at Albaha University, the university needs to reduce its financial expenditure due to the low annual budget that was given by the government for the year 2017, which, at just under £200M, is less than the annual budgets of the two previous years (£232M and £250M for 2015 and 2016, respectively). This obliges the university to provide high-quality services to its key stakeholders whilst maintaining existing capabilities as long as they serve their purposes. An assessment of existing IT capabilities and their fit with business services provided by the university is then seen as another motivation for carrying out this alignment evaluation in order to construct a clear picture of whether or not these existing capabilities are still providing satisfactory levels of support to business needs at the university.

Besides providing a clear view of the university's strategies and competencies, Stage 1 produces as an output a set of KPIs that is mapped to core teaching, learning and management services to guide the investigation of these services and their supporting IT resources in the second stage of analysis.

6.3 Stage 2: Business Operations Analysis

In this stage of analysis, the list of business services that are mapped in the first stage are analysed and profiled in Stage 2_A. Then, supporting IT services are analysed and profiled in Stage 2_B. The purpose is to comprehensively understand and determine the capability of these services offered at Albaha University to facilitate their alignment assessment in the

following stages of the BITAAM.

6.3.1 Stage 2_A: Business Service Analysis and Profiling

Fourteen teaching, learning and student management services are put under investigation in this stage, guided by strategic motives from the first stage of analysis (see Figure 6.4). The set of Teaching and Learning (T&L) services represent the most widely offered T&L services in Higher Education Institutions (HEIs) (Hénard and Roseveare, 2012, Nicholls, 2002, Campbell and Norton, 2007). Similarly, the set of Student Management Services (SMS) shows the primary basic set of SMS offered in HEIs (Paulsen, 2002, Ayoola et al., 2008, Navalta and Mendoza, 2013) excluding fees related services that are not applicable to Albaha University since students are not required to pay tuition fees.

Teaching and Learning Services (T&L)	**Student Management Services (SMS)**
BS4: Module content delivery	BS1: Admission
BS5: Assessment and feedback	BS2: Module enrolment
BS6: Discussion and communication	BS3: Module withdrawal
BS12: Examination	BS7: Materials borrowing
	BS8: Materials returning
	BS9: Hold placing
	BS10: Term deferral
	BS11: Timetabling
	BS13 Attendance
	BS14: Academic record and certification

Figure 6.4: List of core teaching, learning and students management services offered at Albaha University

To establish a comprehensive analysis and profiling of these services, the school of CS and IT is chosen as the data source. This is because multiple tangible and intangible factors need to be analysed for each business and IT service under investigation and this is not possible at the university level.

The *Admission Service* is chosen to demonstrate the business service profiling technique as illustrated in Figure 6.5. This service aims to facilitate admission to academic programmes offered by Albaha University to prospective students. A set of rules that govern the behaviour of the admission service is retrieved from the university's official documents and recorded in the admission service profile as business norms. *KPI22* is also documented in the admission service profile as the performance of the business processes involved in this service, whether high or low, will affect this KPI.

<table>
<tr><th colspan="4">Business Service Profiling</th></tr>
<tr><td colspan="2">Business service name: Admission Service</td><td>Date: 01/11/2016</td><td>Version no: 1.0</td></tr>
<tr><td colspan="2">Business service goal: Provide admission service to prospective students to facilitate admission to a programme at Albaha University.</td><td colspan="2">Business norms: BSN2; BSN3; BSN4; BSN5; BSN5.21; BSN6 from BHU.Rules.2016</td></tr>
<tr><td colspan="4">Business service description: Admission service covers the procedural steps that are required for a prospective student to be undertaken to be unconditionally accepted in a programme at the university.</td></tr>
<tr><td colspan="4">Realised KPI:
KPI22. Students' satisfaction with provided academic and management services.</td></tr>
<tr><td rowspan="3">Business capability</td><td colspan="3">Business service strategic value (BSSV): 5</td></tr>
<tr><td colspan="3">Perceived business service performance (PBSP): 3.59</td></tr>
<tr><td colspan="2">Business process model: BP18, BP19, BP20, BP21, BP22, BP23 and BP24</td><td>Business service efficiency (BSE): Low, caused by delays in BP19 and BP22</td></tr>
<tr><td colspan="4">Business service cross-reference: BS2, BS7, BS9, BS10 and BS11</td></tr>
<tr><td>IS service (ISC):</td><td colspan="3">IS criticality to business service (ISCB):</td></tr>
<tr><td>Admission management</td><td colspan="3">5</td></tr>
</table>

Figure 6.5: The business service profile for the admission service

To enhance the performance of the admission service, the *admission management* capability as an IS Service Capability (ISC) is developed. The high criticality of the *admission management* capability (i.e. *ISC=5*) is not only stated in strategic documentations of the university, but also assigned by the admission service manager, reflecting on its importance in supporting the admission service. This ISC is associated with an IT application (i.e. Banner 8.5.4) that performs the technical functionality for admission activities. This IT application is analysed at a later stage of analysis to examine its alignment with this business service.

The strategic importance of the admission service is assigned high value *BSSV=5*, reflecting its core value-adding to stakeholders. The identified key stakeholder group of this service is prospective students who have the initial role of applicants. This group perceived the performance of this service as *PBSP=3.59* out of 5. However, the internal business service behaviour, in terms of its business processes efficiency, is judged to be low, influenced by low levels of efficiency in business processes 19 and 22. The derivation of all of these business service values is achieved through the application of the business analysis techniques that are defined in B-ITAAM, which are demonstrated in more detail in the following sections.

6.3.1.1 Business Norms Analysis

The purpose of the business norms analysis technique is to articulate where possible the formal and informal rules that are associated with analysed sets of business and IT services at Albaha University. For instance, the formal rules that are stated in Albaha University's official documents for the *Admission Service* include that: *the admission must only open*

once a year for applicants; *the management board of the university must set the number of prospective students who are allowed to apply each year*; *applicants must meet certain criteria to be able to apply for a place at the university*; etc. These business norms can be expressed through the norms analysis technique as shown in Figure 6.6. Norm *BSN5.21* describes the business norm that gives the admission manager the right to extend the admission period once the condition of the low number of applicants is met.

Norms Analysis		
Norm label: *BSN5.21*	Date: *21/11/2016*	Version no: *1.0*
Description: *The rule that allows the admission manager to extend the duration of the admission based on the current number of applicants*		
Principles reference:	*BHU.Rules.2016*	
Whenever <*condition*>	*Admission is opened*	
If <*state*>	*The number of applicants has not reached the maximum number specified by the management board*	
Then <*agent*>	*Admission manager*	
Is <*deontic operator*>	*Permitted*	
To <*action*>	*Extend the admission period*	

Figure 6.6: An example of business norm analysis in the admission business service

Another business norm example is illustrated in Figure 6.7, which is followed through carrying out the assessment of business and IT alignment at Albaha University. This norm affects the flow of the evaluation process of business and IT alignment. According to the norm, the consultant who is carrying out the evaluation of business and IT alignment is obliged to halt the assessment process if two conditions are met: first, business service efficiency in terms of meeting time constraints is low and, second, the perceived value of the business service from its engaged stakeholders is also low.

Norms Analysis		
Norm label: *BSN2.4*	Date: *04/10/2016*	Version no: *1.0*
Description: *The rule that guides whether or not to proceed with business-aligned IT analysis after the values of business service efficiency and business service perceived value are determined.*		
Principles reference:	*B-ITAAM1.5*	
Whenever <*condition*>	*Business service assessment occurs*	
If <*state*>	*The business service efficiency value is low & business service perceived value is low*	
Then <*agent*>	*Consultant*	
Is <*deontic operator*>	*Obliged*	
To <*action*>	*Stop business-aligned IT analysis*	

Figure 6.7: An example of business norm analysis that controls the evaluation process of business and IT alignment

This is because there is no significance from moving on with the investigation of how suitable IT resources are to support a business service that is objectively and subjectively judged as inefficient and ineffective. The outputs of this technique are business norms that are documented in relevant business service profiles, which not only control business service behaviour, but also guide the recommendations for business and IT services at a later stage of assessment.

6.3.1.2 Business Service Strategic Value

The relative capability of each business service analysed at Albaha University is demonstrated within its developed profile. In this, the strategic importance of the business service along with its objective and subjective performance values are documented in related business service profiles. In fact, the set of business services that are examined at Albaha University are all of high strategic importance to the university. This is because these services represent the core services offered in the higher education sector. However, authoritative stakeholders linked with these services are asked through semi-structured interviews to allocate business services strategically according to the business service strategic value categorisation technique that is discussed in Section 5.3.1.2.

For the *Admission Service*, for example, it is assigned *BSSV= 5* by the admission manger because it is not only a primary core business service for prospective students, but it is also a unique service that no other services can provide its functionality. According to the admission manager, a failure in this service would result in a severe negative impact on the university's image. The outputs of this technique are then business service strategic values for the set of business services under assessment at Albaha University through the B-ITAAM. Other business service values indicating the level of performance of these services are derived through the following techniques.

6.3.1.3 Business Service Efficiency Analysis

The Business Service Efficiency (BSE) analysis is carried out for the set of analysed business services at Albaha University with an intention of determining the level of their performance from an objective point of view. For a given business service, number of business processes can be realised to expose its behaviour. Continuing with our example of the *Admission Service*, there are seven business processes that are realised in this service. As shown in Figure 6.8, these business processes represent the internal business processes that are performed by the admission department to admit prospective students onto their desired programmes.

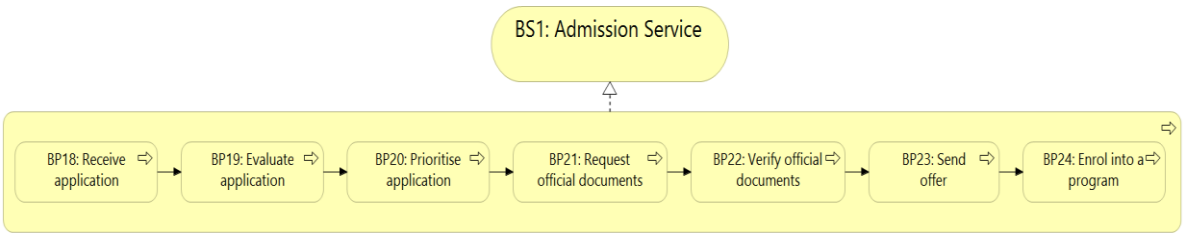

Figure 6.8: The set of business processes that realise the Admission Service

According to The Open Group (2017), a business service should provide a meaningful unit of behaviour to its environment that includes both stakeholders from inside and outside the organisation. Following our example of the *Admission Service*, internal and external stakeholders involved in the admission business service are represented through Business Process Modelling and Notation (BPMN) as depicted in Figure 6.9. Along with the main stakeholders, the rules that specify the number of actors assigned to each task and the duration for each business process to be completed are highlighted to provide a clear snapshot of the business service, facilitating its efficiency analysis.

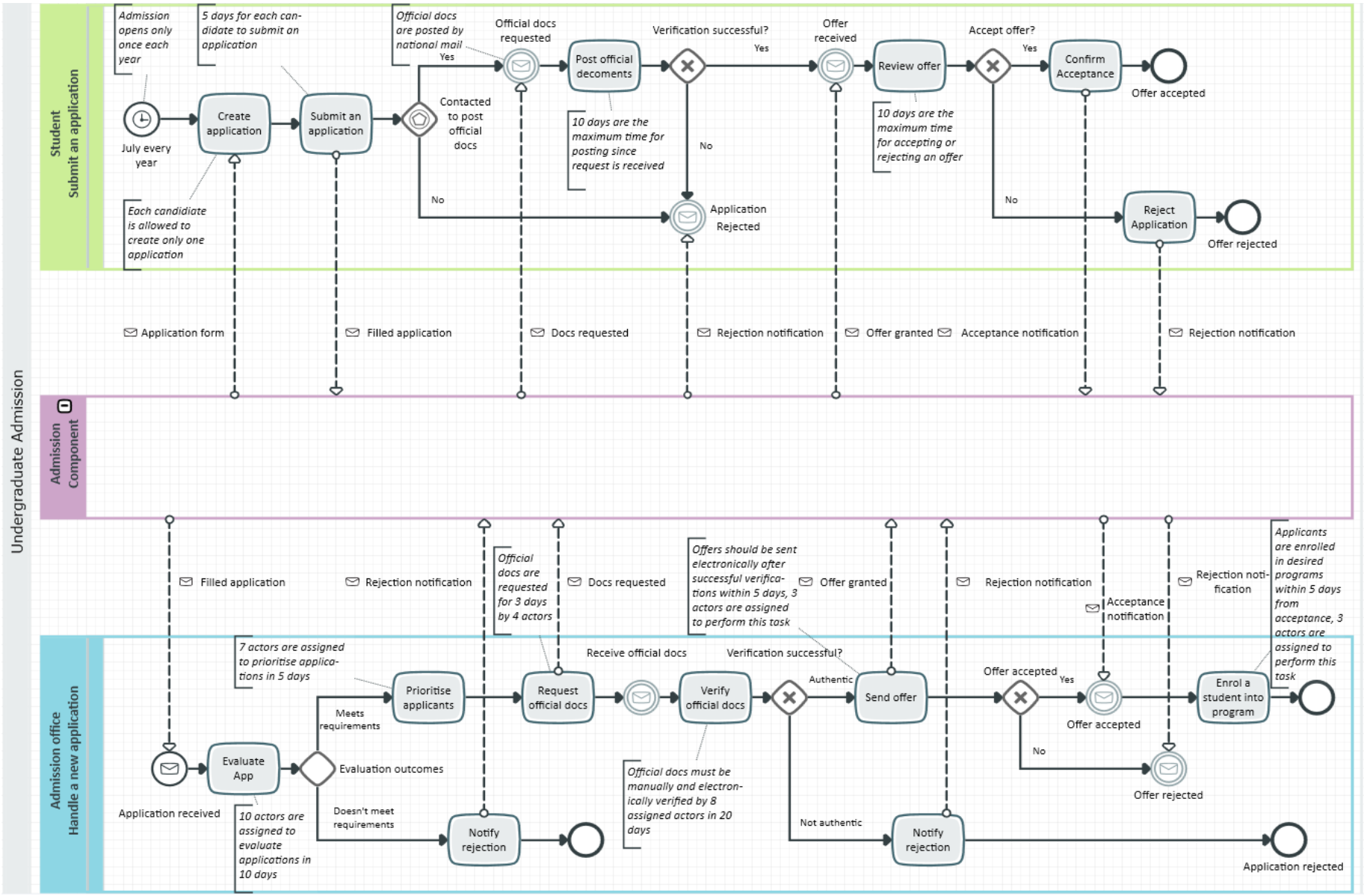

Figure 6.9: The business process model of the admission service

The focus in the BSE analysis is put on internal behaviours of business processes that would affect external stakeholders' perceptions towards the quality of the service if these processes were to fail to meet efficiency requirements. According to Albaha University's official documents, the process of admitting new students opens once a year and takes 73 days to complete from application submission to enrolment onto desired programmes. This is because all high school graduates apply at the same time, requiring enormous effort from the admission department to handle loads of applications simultaneously. Of the 73 days, 25 are allocated to applicants for the submission of application forms, posting official documents to the admission department for verification and finally for accepting generated offers. The other 48 days are allocated for processing applications by the admission team.

The admission service has received criticism from students all around the university during the data collection process. They pointed out that the time-frame for submitting applications through an online portal was not long enough due to the large number of applicants who wanted to submit their applications within only 5 days specified by the university. According to the IT manager, the Banner application that handles these submissions cannot deal with a large number of applications simultaneously. Going into more detail to examine the efficiency of each realised business process, the researcher found through an interview with the admission manager a total delay of 17 days caused by delays in BP19: evaluate applications and BP22: verify official documents, accumulated through 6 days and 11 days, respectively. This exceeds 20% of the total time of the admission service, which is considered as unacceptable and therefore a business service efficiency value is assigned as *BSE = Low*. This value is then documented in the admission service profile.

The efficiency analysis of other business services, such as module content delivery, assessment & feedback and term deferral, is carried out through a set of semi-structured interviews with business and IT managers, programme coordinators and academic staff from the school of CS and IT and the IT department, on one instance analysis, for each business service behaviour. BSE values for the set of fourteen business services analysed at Albaha University are the outputs of the application of this analysis technique, which are documented in relevant business service profiles and used towards the assessment of and recommendations for business and IT alignment in the next stages of analysis.

6.3.1.4 Perceived Business Service Performance Analysis

The Perceived Business Service Performance (PBSP) analysis technique is applied on the set of business services that are under investigation in Albaha University. The aim is to

examine the performance of these services as they are perceived by their engaged stakeholders. For the *Admission Service,* for instance, 60 students from the first-year group within the school of CS and IT have provided inputs about their perceptions towards the performance of the admission service (see Figure 6.10) (full version of data is presented in Appendix F). A weighting value for each stakeholder (i.e. student) is equally assigned as 0.016. This is because all participated students are from the same year group and, have gone through the admission experience at the same time. The weighting value for each criterion is assigned by the researcher and adjusted and confirmed by the business service owner (i.e. admission manager), who is responsible for assuring that the service performs according to strategic objectives and therefore can determine the areas in which the admission service must excel.

Perceived business service performance						
Business service name: Admission Service		Date: 26/10/2016				Version No: 1.0
No.	Assessment criteria	CW / SW	Student1	Student2		Student60
			0.016	0.016	…	0.016
1	The offering of the business service is clearly defined	0.15	1.00	2.00	…	2.00
2	The business service is delivered to end consumer in a timely efficient manner	0.10	1.00	-1.00	…	-1.00
3	The business service is deemed crucial to the end consumer	0.10	2.00	2.00	…	2.00
4	Risks can be imposed to the data of the business service consumer	0.15	1.00	-1.00	…	1.00
5	A mechanism to provide feedback on business service offering is accessible	0.10	-1.00	-2.00	…	-2.00
6	Consumers can deal with the business service with no additional required knowledge and skills	0.15	3.00	2.00	…	2.00
7	End consumer's expectations from the business service are met	0.25	-1.00	-2.00	…	1.00
$V_i = \left(\sum_{j=1}^{7} sv_j \times cw_j\right) \times sw_i$			0.012	-0.002	…	0.022
$PBSP = 1 + \left(\sum_{i=1}^{n} V_i - LV\right) \times \frac{(5-1)}{(HV-LV)}$						**3.59**

Figure 6.10: Students' perceptions about admission service performance

The PBSP value of the admission service is 3.59, which is interpreted as medium. This medium value indicates the quality of the admission service performance from an intangible social point of view. Although students appreciate the clarity of the admission service offerings, there is general agreement among them that there is no accessible mechanism to provide feedback about the service capability. A significant number of students have also highlighted that the service did not meet their expectations.

Interestingly, participants in the second assessment criterion were not satisfied about the efficiency of the admission service in terms of its delivery time. This complements the

outcomes from BSE analysis, where 17 days of delay is reported due to the inefficiency of two business processes involved in the admission service. These two values, the BSE value and the PBSP value, complement each other and provide a holistic reflection of the business service performance from tangible and intangible perspectives. In relation to the overall picture of business and IT alignment, these business service values play a key role in determining the business value of IT resources invested in by Albaha University and, therefore, lead to recommendations to enhance IT resources with more awareness of the capability of aligned business services.

6.3.1.5 IS Service Criticality to the Business

The level of criticality of IT support to each business service under examination at Albaha University is determined through this IS service criticality analysis. Following our example of the admission service, the strategic document of Albaha University (BHU.SP, p.106) points to the high level of criticality of having a robust system to support students' admission service. This is supported by inputs from the admission manager, who stated in an interview that "*with only 16 employees at the admission department, we must have a robust admission system to handle prospective students' applications, especially when the number of applicants exceed 20,000 as of July 2016*". *Admission Management,* as an IS service capability that is required to support its business processes, is then assigned a value of *ISC=5*. This value indicates the high level of importance of the mapping between the admission service and its supporting IT service. However, it does not indicate the degree of fit between these two services, which is going to be determined in the third stage of analysis through the B-ITAAM. The ISC value of the admission management service is then documented in the admission service profile as shown at the bottom of Figure 6.5.

The level of criticality of other IS services in relation to business services is similarly assigned based on either strategic documents or inputs from business service owners. For instance, the programme director at the school of CS and IT believes that it is still not necessary for all modules in the IS programme to be delivered through Blackboard and therefore, on a scale from 1-5, he assigned *ISC=3.7* for the module content delivery service.

Fourteen business service profiles are formulated to be the B-ITAAM output of Stage 2_A. Each profile groups information that represents the main feature of a business service and its capability as business service values that are derived through the business analysis tools defined in B-ITAAM. These values are then retrieved in further stages of analysis to support business and IT alignment assessment and recommendations.

6.3.2 Stage 2_B: IT Service Analysis and Profiling

Continuing with the business operations analysis of Albaha University, this sub-stage aims to analyse the set of IT services that support the 14 profiled business services in Stage 2_A. IT services are independently analysed and profiled, supported by the developed IT repository for Albaha University. First, the IT repository created for Albaha University is introduced, followed by comprised IT service profiles.

6.3.2.1 IT Repository

28 IT applications that are deployed at Albaha University to support primary and secondary business services are analysed in this stage of analysis. Specifications about these IT applications are organised into an IT repository since the university does not have a formal existing IT catalogue for its IT resources. The main specifications, as well as cost drivers, for each IT application are searched, tracked and documented in this repository as illustrated in Figure 6.11. Besides reviewing official documentation and carrying out face-to-face interviews with IT staff to form the IT repository and IT service profiles, external resources including official IT applications' websites, white papers and available public documents are reviewed due to the difficulty that was faced in retrieving technical and financial data from the university.

The documentation of main specifications of IT applications in an IT repository, as illustrated in Figure 6.11, is helpful in the process of the B-ITAAM. For instance, the status of an IT application provides the first indication by which an alignment assessment of the application should be established or not, since it is unnecessary to carry out a business and IT alignment assessment for IT applications that are inactive. The functionality feature of an IT application which represents its main functions supports a segmentation of the IT functions that are being used or unused. This helps to focus the assessment on the used functions in order to examine their alignment with business services. The level of integration of an IT application with other applications supports the tracking of the relationships that exist between different components across different applications to see the impact of underperforming components on other linked business services. Targeted users of an IT application also supports the assessment of business and IT alignment by directing the social assessment towards the key stakeholder groups who benefited most from an IT application component.

IT repository														
Main specifications											Cost Drivers			
Item Ref:	**Item name**	**Item Type/ Source**	**Item status**	**Functionality features**	**Criticality to the business**	**Granularity level**	**Level of Integration**	**Level of usability**	**Targeted users**	**Age**	**Purchase cost**	**Maintenance cost**	**Change cost**	**TCO**
1	Banner 8.5.4	Application/ OTS with 40% level of customisation	Active	Student information management system; Admission tool; Enrolment tool; Academic administration tool.	Mission critical	University level	Integrated with Blackboard Learn 9.1.2	More frequently used item	Students; academic staff; employees	27/10/2008	£2,138,482	£192,522 per year	Two upgrades costing £192,522 each	£4,256,224
2	Blackboard Learn 9.1.2	Application/ Outsourced (cloud based)	Active	Teaching and learning system	Mission critical	University level	Integrated with Banner 8.5.4	Less frequently used item	Students; academic staff	02/07/2014	£5,354,839 contract for five years with maintenance and support included.		-	£5,354,839
3	ERP (HR Module 12.1.3)	Module/ OTS with some customisations applied in house	Active	Manage human resources. Manage employee information, track and keep records of employee performance reviews, assignments, job descriptions and skills.	Mission critical	Human resource department	Integrated with other ERP modules	More frequently used item	Employees	25/03/2009	1st contract for all ERP modules costs £935,072 for 2009 only. 2nd contract for 2010 and 2011 costs £423,434. 3rd contract costs £470,483 for 2012, 2013, and 2014. 4th contract costs £2,294,626 for 2015, 2016 and 2017 including 2 new modules and 4 in house consultants. *support and maintenance are included in all contracts.			£4,123,615
11	HCM	Application/ custom-built	Active	Manage and track incoming-outgoing correspondence between departments, units, and schools	Mission critical	University level	Not integrated	More frequently used item	Employees	01/06/2016	£64,727 + £5393 for photo capturing licence	included in ERP invoice	-	included in ERP invoice
22	Dawam	Application/ custom built	Active	Employee attendance monitoring system through fingerprint	Mission critical	University level	Integrated with ERP (HR)	More frequently used item	Employees	28/09/2013	Development and maintenance costs are included in ERP contracts		-	included in ERP invoice
23	Symphony 3.4	Application/ OTS	Active	Cataloguing, circulation, acquisitions, serials, academic reserves, materials booking, collection exchange.	Mission critical	University central library	Not integrated	More frequently used item	Students; academic staff;	08/11/2011	£170,814 including maintenance and support		-	£170,814

Figure 6.11: Partial content of Albaha University IT Repository

6.3.2.2 IT Service Profiling

An IT service profile groups a single IT application with its associated used and unused components into one packaged IT service. Figure 6.12 and Figure 6.13 are examples of two fundamental IT services offered at Albaha University.

<table>
<tr><th colspan="3">IT Service Profiling</th></tr>
<tr><td>IT service name: Higher education information management service</td><td>Date: 07/11/2016</td><td>Version no: 1.0</td></tr>
<tr><td colspan="3">IT service description: IT support for managing student information and providing academic support for both students and academics at Albaha University.</td></tr>
<tr><td>IT application name: Banner 8.5.4</td><td colspan="2">IT service cost: £4,256,224</td></tr>
<tr><td>Used application components:
1) Admission component.
2) Enrolment component.
3) Timetabling component.
4) Academic records and certification component.
5) Module withdrawal component.
6) Term deferral component.
7) Attendance component.
8) Content delivery component.
9) Examination information component.</td><td colspan="2">Unused application components:
1) Financial component.
2) Accounting components.
3) Communication component.</td></tr>
<tr><td>IT technical infrastructure:
Database server: SUN Solaris 10 64bit; Banner inb server: SUN Solaris 10 64bit; Banner ssb server: SUN Solaris 10 64bit; 2 Banner ssb server: SUN Solaris 10 64bit; Banner Database Virtual Server: Solaris 10; Banner Application Virtual Server: Solaris 10; Banner Web Application Virtual Server: Solaris 10; Banner Database Virtual Server: Solaris 10; Banner Application Virtual Server: Solaris 10; Banner Web Application Virtual Server: Solaris 10.</td><td colspan="2">Technical specifications required to consume the service:
1 GHz CPU or greater with minimum of 512MB RAM
Network adapter: LAN (Ethernet) or wireless (Wi-Fi).
DSL or cable broadband Internet.
Windows XP, Vista or later;
MAC OS X 10 or later;
JAVA Runtime Environment 6.</td></tr>
</table>

Figure 6.12: IT service profile for student information management service

Albaha University invested in Banner 8.5.4 to manage student information and also to provide academic support to both students and academic staff at the university. The active components of Banner 8.5.4 are documented in the IT service profile. This helps to realise the units of functionality that are adding value to business requirements from Banner 8.5.4 in relation to the full list of its capabilities. There are some inactive components in Banner 8.5.4, such as the billing and accounting components, which come with the application package but are not activated because students at Albaha University are not required to pay tuition fees.

As another example, Blackboard Learn 9.1.2 comes with a long list of capabilities to support teaching and learning services provided at Albaha University. However, since it has just been deployed by the university in mid-2014, only a few components are active, as illustrated in Figure 6.13. This issue should be considered for any cost benefit analysis of such applications in the future assessment of business value of IT.

IT Service Profiling		
IT service name: *Teaching and learning management service*	Date: *13/12/2016*	Version no: *1.0*
IT service description: *IT support for teaching and learning activities at Albaha University.*		
IT application name: *Blackboard Learn 9.1.2*	IT service cost: *£5,354,839*	
Used application components: *1)Content delivery component.* *2)Assessment and feedback component.* *3)Communication and discussion component.*	Unused application components: *1) Creating courses online.* *2) Grading courses online.* *3) Preventing plagiarism component.* *4) Access to social learning.* *5) Access to blackboard's global learning environment component.*	
IT technical infrastructure: *Cloud based application.* *"Saudi Electronic University purchased a permanent license of (Blackboard) for all other Saudi government universities for 2,600,000 users Including development, update and upgrade as agreed between the Ministry of Education and Saudi Electronic University to manage this project."* *Saudi Electronic University then charges other public universities for using the application, train employees at these universities to deal with the educational content and solve technical issues that may face academic staff and student.*	Technical specifications required to consume the service: *1.5 GHz CPU or greater with minimum of 1GB RAM* *Network adapter: LAN (Ethernet) or wireless (Wi-Fi).* *DSL or cable broadband Internet.* *Windows XP, Vista or later* *MAC OS X 10 or later (Mac OSX 10.4 "Tiger" is not supported)* *JAVA Runtime Environment 6*	

Figure 6.13: IT service profile for teaching and learning management service

Three IT services at Albaha University are profiled for the purpose of this study. They include major IT applications (i.e. Banner 8.5.4, Blackboard 9.1.2 and Symphony 3.4), which are being used worldwide in higher education institutions for teaching, learning and other students' academic and management services. Besides the two illustrated IT profiles, another IT profile is created for the library management service, which groups the Symphony 3.4 application along with its technical components in one packaged IT service.

The comprehensive analysis of existing IT resources at Albaha University carried out in this sub-stage has resulted in an IT repository that is developed to support the profiling of core IT services. These IT service profiles represent the output of Stage 2_B. Now the sets of business and IT services that have been analysed in Stage 2_A and Stage 2_B, respectively, are ready for mapping and evaluation from an alignment perspective in the next stage of analysis.

6.4 Stage 3: Mapping and Analysis of Relative Benefits of IT

In this third stage of analysis, the set of business and IT services that have been analysed and profiled from Albaha University in the previous stage are mapped through IS services. The purpose is to facilitate the assessment of their alignment through a relative benefit analysis that aims to determine the degree of fit between these services through a number of business

analysis techniques. The mapping of the analysed set of business and IT services is firstly performed in this stage, followed by an assessment of the relative benefits of IT services to aligned business services.

6.4.1 Mapping of Business and IT Services through IS Services

The mapping of business services to corresponding IT components that fulfil the technical requirements of these services is established through IS services in this stage of analysis. At Albaha University, 14 core academic and management services enabled by 3 IT applications have been mapped through 14 IS services, as illustrated in Table 6.2. Each mapping is labelled with a reference number as *BSITAC,* reflecting the business service and its corresponding IT application component that supports its behaviour. Since the physical boundaries between IT components supporting business processes are not taken into account, each IT component is treated as an IT service that groups IT capabilities from one or more application components to support one or more business processes. Within illustrated mappings, various complex links between business services, IS services and IT services exist. These links are explained in the business and IT alignment scenarios in Section 5.4.1.

Table 6.2: Mapping of core business services to corresponding IT services at Albaha University

No	Business Service (BS)	IS Service (ISC)	IT Application Component (ITAC)	IT Application (ITA)
BSITAC1	Admission service	Admission management	Student admission component	Banner 8.5.4
BSITAC2	Module enrolment service	Enrolment management	Module enrolment component	Banner 8.5.4
BSITAC3	Module withdrawal service	Enrolment management	Module withdrawal component	Banner 8.5.4
BSITAC4	Module content delivery service	Module content delivery management	Content delivery component	Blackboard Learn 9.1.2
BSITAC5	Assessment and feedback service	Assessment and feedback management	Assessment & feedback component	Blackboard Learn 9.1.2
BSITAC6	Discussion and communication service	Communication management	Communications management component	Blackboard Learn 9.1.2
BSITAC7	Materials borrowing service	Materials management	Borrowing component	Symphony 3.4
BSITAC8	Materials returning service	Materials management	Returning component	Symphony 3.4
BSITAC9	Hold placing service	Materials management	Hold placing component	Symphony 3.4
BSITAC10	Term deferral service	Term deferral management	Term deferral component	Banner 8.5.4
BSITAC11	Timetabling service	Timetabling management	Timetabling management component	Banner 8.5.4
BSITAC12	Examination information service	Examination information management	Examination information management component	Banner 8.5.4
BSITAC13	Attendance service	Attendance management	Attendance management component	Banner 8.5.5

BSITAC14	Academic record and certification service	Academic record and certification management	Academic record and certification component	Banner 8.5.6

One business service can be enabled by IT capabilities from a single IT application through one IS service. For instance, the *admission service* in (*BSITAC1)* is enabled by the *admission management component* from *Banner 8.5.4* through the *admission management* IS service. However, a variety of complex relationships exist between business services and supporting IT components. For example, the *module enrolment service* (*BSITAC2)* is enabled through a collaboration between *student admission* and *module enrolment* components. This is because students will not be allowed to enrol onto specific modules unless their eligibility is verified through the admission component. This relationship is less complex since both ITACs are from the same IT application, whereas with *BSITAC4,* the *module content delivery service* is enabled through a collaboration between two components from two different IT applications *(i.e. module content delivery component from Blackboard Learn 9.1.2* and *module enrolment component from Banner 8.5.6).*

The purpose of establishing these mappings in this stage of analysis is to determine the quality of the alignment between each analysed business service at Albaha University and its supporting IT component (i.e. IT capabilities). This will highlight the competence of individual IT components, leading to an understanding of the competence of all analysed IT applications implemented at the university. The quality of each mapping initiated, or, in other words, the relative benefits from IT capabilities in supporting business needs, are evaluated next through a set of tangible and intangible factors.

6.4.2 Analysis of Relative Benefits of IT

The relative benefits of IT capabilities that are obtained by the set of profiled business services at Albaha University are analysed in this stage of analysis. This paves the way for observing the quality of the links that have been initiated between business and IT services. The analysis of the relative benefit values of IT components is performed through the following tangible and intangible factors.

6.4.2.1 Users' Perceptions towards IT Application Components

Evaluating the set of analysed IT capabilities at Albaha University from a social perspective is carried out through Users' Perceived Value (UPV) analysis. In many situations, users of IT applications at the university only interact with a few components of an IT application and not with the whole list of IT application capabilities. This is reflected in the UPV analysis

technique, where the criteria are designed to evaluate users' perceptions towards IT application components rather than towards individual IT applications. Figure 6.14 shows the perceptions of 60 students from the same year group from the school of CS and IT towards the usability and usefulness of the admission component to support the admission service (the full version of data is presented in Appendix G). Besides being key stakeholders of the admission service, these students are key targeted group of users of the Banner application in general and the admission component in particular.

Users' perceptions of an IT component						
IT component name: Admission Component		Business service name: Admission Service		Date: 23/11/2016		Version No: 1.0
No.	Assessment criteria	CW / UW	User1	User2	…	User60
			0.02	0.02	…	0.02
1	The IT component fits well with the user style or mode	0.05	3.00	2.00	…	2.00
2	The IT component enables the user to accomplish relevant task(s) more quickly	0.10	1.00	3.00	…	2.00
3	The IT component is easy to use	0.15	-1.00	-2.00	…	-2.00
4	The IT component ensures equal opportunity for all users	0.15	-1.00	-2.00	…	1.00
5	The IT component improves communications with other relevant stakeholders	0.01	0.00	0.00	…	2.00
6	User's information is kept confidential throughout the use of the IT component	0.10	1.00	0.00	…	2.00
7	The IT component is compatible with all the aspects of the user's task(s)	0.10	-2.00	0.00	…	0.00
8	It becomes more interesting to use the IT component in the execution of relevant task(s)	0.02	-1.00	-3.00	…	1.00
9	It is easy for the user to become more skilful in using the IT component in executing relevant task(s)	0.02	-1.00	1.00	…	0.00
10	The IT component is capable to provide appropriate support when problems arise and need prompt solutions	0.10	-3.00	-2.00	…	-1.00
11	I am totally satisfied with the use of this component to support my business activities	0.20	-1.00	1.00	…	-1.00
$V_i = \left(\sum_{j=1}^{11} uv_j \times cw_j\right) \times uw_i$			-0.012	-0.004	…	0.001
$UPV = 1 + \left(\sum_{i=1}^{n} V_i - LV\right) \times \frac{(5-1)}{(HV-LV)}$						**2.46**

Figure 6.14: Students' perceptions of the admission component

The UPV of 60 students towards the usability and usefulness of the admission component resulted in 2.46 out of 5, which is considered to be *low* in accordance with the guide presented in Section 5.4.2.1. Students mostly agree through their inputs that the admission component is not easy to use. They also point out that there were unequal opportunities for them to access the admission service as the service faced many disruptions during the admission period. In addition, the majority of students complained about the missing mechanism for support when problems arose during the admission process. Finally, large

numbers of students highlight in the last assessment criterion that they were not totally satisfied with the use of the admission component to support them through admission activities. These factors have negatively affected the perceptions of students towards the admission component and, consequently, the overall level of alignment between this component and the admission service.

Perceptions about the severity impacts on the organisation from the failure of an IT application as perceived by key authoritative stakeholders

Figure 6.15 shows the severity impact assessment that has been conducted on three IT applications at Albaha University.

IT application severity impact analysis			
Organisation name: Albaha University		Date: 22 November 2016	Version No: 1.0
Level of impact	No impact	Middle impact	Severe impact
Criteria	- Non-public damage to the university's reputation. - No negative impacts on customer satisfaction. - No impacts on the level of productivity of employees. - No impacts on the level of productivity of academic staff.	- Indirect revenue impact. - Indirect negative customer satisfaction. - Board of the university has little or no visibility of performance across the university. - Moderate productivity degradation. - Some productivity tools may not be available to users. - Longer times for processing requests.	- Widespread business stoppage with significant future revenue impact. - Public, wide-spread damage to university's reputation - Direct revenue impact. - Direct negative customer satisfaction. - Compliance violation. - Significant employees and academic staff productivity degradation.
Banner 8.5.4			8
Blackboard Learn 9.1.2		5	3
Symphony 3.4		2	6

Figure 6.15: Severity impact analysis of Banner 8.5.4, Blackboard 9.1.2 and Symphony 3.4

Eight authoritative business and IT stakeholders at Albaha University were asked through a short questionnaire to provide a severity impact assessment of three IT applications: Banner 8.5.4, Blackboard Learn 9.1.2 and Symphony 3.4. Stakeholders include the university vice-president of academic affairs, the university vice-president of postgraduate studies, the head of the e-learning department and 5 other authoritative personnel from the IT department. There is total agreement among these stakeholders that any failure in Banner 8.5.4 will have a severe impact on the university. Similarly, the majority of respondents pointed out that failures in Symphony 3.4 would cause severe impact on the university. On the other hand, Blackboard Learn 9.1.2 is judged to mostly have a middle impact on the university, although it is a main IT application that supports primary teaching and learning services at Albaha University and many other universities worldwide. This might be attributed to the fact that

this application package is still in its early stages of implementation at the university and full awareness of its value-adding to teaching and learning services among students and academic staff may not yet be recognised.

This severity impact analysis illustrates the current level of importance of the set of analysed IT applications at Albaha University as perceived by authoritative stakeholders from the university. It does not aim to directly influence the business and IT alignment assessment in B-ITAAM, but it highlights the organisational aspects that would be affected once the IT application, or any of its components, fail to perform as desired. This severity impact analysis can be referred back to before any decision is made regarding changes to either the whole IT application or any of its components.

6.4.2.2 Technical Quality of IT Applications

The technical quality of analysed IT applications at Albaha University is another area that is examined through B-ITAAM to determine its influence on the level of alignment between business and IT services. This technical quality analysis is carried out following the set of criteria that is defined in Section 5.4.2.2. The IT technical team at Albaha University is approached through questionnaires to carry out this analysis. The technical team involves the IT technical manager, two technical junior managers and five other technical workers. Their responsibilities involve the management, maintenance and support of IT applications and they are considered to be the most knowledgeable IT technicians at the university. They are assigned weighting values according to their level of influence in the assessment. They have provided their inputs about the technical capability of Banner 8.5.4 as illustrated in Figure 6.16.

Technical quality analysis of an IT application										
IT application name: Banner 8.5.4		Date: 19/10/2016				Version No: 1.0				
No.	Assessment criteria	CW / TW	Mgr1	Mgr2	Mgr3	Em1	Em2	Em3	Em4	Em5
			0.20	0.15	0.15	0.10	0.10	0.10	0.10	0.10
1	Banner 8.5.4 currently meets the needs of Albaha University key stakeholders (students-academic staff-employees) for supporting teaching and administration services	0.20	2.00	1.00	2.00	-1.00	-1.00	1.00	1.00	1.00
2	Banner 8.5.4 is capable to sustain stability regardless the changes that are required to be applied to its functionalities	0.10	2.00	1.00	3.00	1.00	-1.00	1.00	-1.00	1.00
3	Banner 8.5.4 is capable to handle exponential increase of task in stable manner	0.15	-2.00	-1.00	-3.00	-2.00	-2.00	-1.00	-2.00	-1.00
4	Banner 8.5.4 is capable to maintain performance level during stable and unstable conditions	0.10	-2.00	-1.00	-2.00	-3.00	-2.00	-2.00	-1.00	-1.00

5	The use of Banner 8.5.4 is seamless for key stakeholders (students-academic staff-employees)	0.05	3.00	2.00	3.00	2.00	3.00	2.00	3.00	2.00
6	Banner 8.5.4 is capable to extend its capacity or functionality to accommodate new specifications of the business service	0.10	2.00	2.00	1.00	3.00	-1.00	1.00	2.00	3.00
7	Banner 8.5.4 is capable to stabilise even when changes occur in the university operation environment	0.10	1.00	-1.00	1.00	-2.00	-1.00	-1.00	-1.00	-1.00
8	Banner 8.5.4 is capable to inter-operate with other IT applications/ systems	0.15	2.00	1.00	2.00	2.00	3.00	2.00	2.00	3.00
9	The time for Banner 8.5.4 to react to functional changes is reasonable	0.05	1.00	-1.00	1.00	1.00	-2.00	-1.00	-1.00	2.00
$V_i = \left(\sum_{j=1}^{9} tv_j \times cw_j\right) \times tw_i$			0.18	0.05	0.11	-0.02	-0.05	0.03	0.02	0.09
$ITQ = 1 + \ (\sum_{i=1}^{n} V_i - LV) \times \frac{(5-1)}{(HV-LV)}$										**3.28**

Figure 6.16: Technical quality analysis of Banner 8.5.4

The resulting value from the technical quality assessment of Banner 8.5.4 shows a medium level of technical capability: ITQ=3.28 out of 5. This medium (near to low) value is because a result of the negative inputs in criteria 3 and 4. The technical team seems to agree that Banner 8.5.4 is not capable of handling a large number of requests at the same time. The reliability of the application has also received criticism with general agreement among the technical team that Banner 8.5.4 cannot maintain performance when unexpected situations arise. Students have pointed out these technical inefficiencies earlier in their perceptions of the admission component. To reiterate, they complained that they did not have an equal opportunity to access the admission service and the technical team confirms that Banner 8.5.4 cannot handle large number of users simultaneously.

In the same questionnaire, the technical team is asked to rate each technical capability mentioned in the questionnaire above based on its criticality to the business requirements (see Figure 6.17). This reveals the technical team's understanding of business strategies and also points out the technical aspects that must be maintained in order for the IT application to run as required.

IT application: Banner 8.5.4			Date: 19/10/2016		
Criteria	Not critical	Slightly critical	Somewhat critical	Critical	Very critical
Functionality			1	1	6
Maintainability			2	3	3
Scalability				1	7
Reliability				4	4
Ease of use			3	3	2
Extensibility			2	3	3
Adaptability			1	5	2
Interoperability			3	3	2
Response time		1	1	2	4

Figure 6.17: Technical capability priority assessment of Banner 8.5.4

As shown in Figure 6.17, 7 out of 8 technical members have stressed the importance of

having a scalable IT application that can handle an exponential increase of requests from users. The functionality of the IT application to perform in harmony with users' needs is also important, as pointed out by 6 members from the technical team. Other technical aspects have ranged from somewhat critical to very critical, as illustrated in the figure.

6.4.2.3 Business Financial Gains Acquired from IT Application Usage

The purpose of this Financial Gain (FG) analysis is to determine from a financial point of view the benefits that are obtained by Albaha University from the of deployment of the set of analysed IT applications. Banner 8.5.4 is simulated in this FG analysis to illustrate the relative financial benefits of embracing this application as a support for students' academic and management services (see Figure 6.18.). The IS manager at the university assigns weighting values to the criteria and specifies for each criterion whether it has been met, partially met or not met according to his views and also according to the financial reports of the university. He is the most suitable person to carry out this assessment according to Seddon et al. (2002).

Financial Gains Analysis				
IT application name: Banner 8.5.4	Date: 1/11/2016	Version No: 1.0		
Assessment criteria		Criteria weight	Value	Percentage achieved
Reduce time for completing tasks per employee		0.20	0.5	75%
Reduce number of employees towards labour cost		0.25	1.0	75%
Increase velocity in achieving assigned tasks		0.20	0.5	80%
Increase end user level of satisfaction		0.30	0.5	65%
Increase innovation for business growth		0.05	0.5	20%
Financial gains value = $\sum Criteria\ weight * Value$ =		0.63		

Figure 6.18: Financial gains analysis of Banner 8.5.4

According to the IS manager, the number of employees handling students' management services, including admission, module enrolment, term deferral and timetabling, has been reduced as a result of implementing Banner 8.5.4. Official statistics from the information unit at the university show that there are only 16 employees who handle students' management services. The IS manger considers this achievement to be 75% of what is targeted, aiming to further reduce the number of employees to only 12 in the next five years. The other aspects of financial gains acquired from Banner 8.5.4 are considered to be partially met with a variance percentage of achievement resulting in 63% as a relative total FG value from the deployment of this IT application. The IS manager considers this FG value to be below the optimal targeted financial benefit value from the deployment of this IT application at the university, given the fact that the university has spent over £4.2M on the total cost of ownership of this IT application since October 2008.

6.4.2.4 Usage Pattern of an IT Application Component

The usage pattern of analysed IT components (ITU) at Albaha University is carried out in this stage of analysis with an intention of determining the degree of fit of these components in supporting related business services. The usage pattern of the set of mapped IT application components at the beginning of Stage 3 is then examined through semi-structured interviews with key authoritative business and IT stakeholders from Albaha University (namely, business service owners and IT application managers). Some IT application components within analysed IT applications are used more frequently than others and this has been indicated in each component's usability value in this analysis.

For instance, Banner 8.5.4 application is a highly used IT application that is deployed by Albaha University to support and enable students' academic and management services. The total number of active users of this application is 22,800 including students, academic staff and employees according to statistics shared by the IT application manager in September 2016. This real-time data provides an indication of the high level of usability of the application, which exceeds 80% from its total 27,863 registered users. The IT manger then specifies the IT components that are being more frequently used on a scale from 1-5, with 5 being more frequently used IT components. Within Banner 8.5.4, the admission, module enrolment and timetabling components are assigned high usability values (ITU=4.70, ITU=4.20 and ITU=4.50, respectively), compared with other less used components such as module withdrawal and term deferral (ITU=3.90 and ITU=3.40, respectively). Business service owners and key stakeholders including programme coordinators, academic staff and department managers are referred to for confirming the level of usage of other relevant IT application components analysed at Albaha University.

It is beneficial to carry out the usage pattern analysis per IT component, since this can assist with the derivation of more sensible IT application recommendations at a later stage of analysis. For instance, an IT application component can be critical to supporting the business needs and, at the same time, be highly used but poorly perceived by its users. This IT application component can then be specifically targeted for enhancement regardless of other components' statuses within the same IT application. The level of usability of individual IT components within an IT application can then provide a close indication of the total usage pattern of the whole IT application.

By the end of this step of analysis, the relative benefit values of the analysed set of IT resources mapped to related business services at Albaha University are determined. However, these values are derived independently from different angles for each IT

component, which require integration for each mapping that is initiated at the beginning of Stage 3 to determine the relative benefit value for each business-aligned IT case. This is achieved in the next stage of analysis.

6.4.3 Relative Benefit Aggregated Value

Table 6.3 presents the Relative_Benefit (R_B) values for the business-aligned IT mappings that have been initiated at the beginning of this stage in Table 6.2. The H, M and L categories indicate the quality of ITACs to provide support to related business services. In other words, these categories reflect the level of the relative benefit that a business service receives from aligned ITAC. For example, the module enrolment component in *BSITAC2* provides a high level of benefit to the module enrolment service. Besides being critical to the business service itself, this ITAC shows high levels of usage by students and they also have positive attitudes towards its usability for enrolling onto academic modules. On the other hand, the admission component in *BSITAC1* shows a low level of benefit to the admission service. Although this ITAC is critical to supporting the admission service and it is a highly used component, the low perceived value of its effectiveness in supporting the admission service has contributed to its low benefit value.

BSITAC11 should not be processed further through the B-ITAAM. This is because both the Business Service Efficiency (BSE) and the Perceived Business Service Performance (PBSP) of the timetabling service are low. It is only processed in this table to illustrate the point that poor business services should reach at least a medium level of effectiveness to be evaluated for alignment with IT services. The norm that is introduced in Figure 6.7 explains this issue in more detail.

The R_B values that are produced by the end of this stage are only capable of indicating the significance of the analysed set of ITACs in Albaha University for enabling relevant business services. This step, however, does not take into account the quality of the business services themselves, which makes it difficult to draw sensible recommendations regarding the set of analysed ITACs without being aware of the capability of aligned business services. This then leads to a further analysis to assess the value of ITACs in supporting business services while considering analysed values from the business services themselves.

Table 6.3: Relative benefit analysis of ITACs

No	Business Service (BS)	IS Service (ISC)	IT Application Component (ITAC)	IT Application (ITA)	UPV	ITQ	FG	ITU	ISC	Total R_B	R_B value	Category
BSITAC 1	Admission service	Admission management	Student admission component	Banner 8.5.4	2.4600	3.2800	3.1500	4.7000	5.0000	18.5900	2.7651	L
BSITAC 2	Module enrolment service	Enrolment management	Module enrolment component	Banner 8.5.4	4.3000	3.2800	3.1500	4.2000	5.0000	19.9300	4.4667	H
BSITAC 3	Module withdrawal service	Enrolment management	Module withdrawal component	Banner 8.5.4	4.5000	3.2800	3.9000	4.2000	3.1500	19.0300	3.3238	M
BSITAC 4	Module content delivery service	Module content delivery management	Content delivery component	Blackboard Learn 9.1.2	4.1000	4.1000	3.1000	3.8000	3.7000	18.8000	3.0317	L
BSITAC 5	Assessment and feedback service	Assessment and feedback management	Assessment & feedback component	Blackboard Learn 9.1.2	3.2000	4.1000	3.1000	3.3000	3.5000	17.2000	1.0000	L
BSITAC 6	Discussion and communication service	Communication management	Communications management component	Blackboard Learn 9.1.2	4.0000	4.1000	3.1000	3.5000	4.5000	19.2000	3.5397	M
BSITAC 7	Materials borrowing service	Materials management	Borrowing component	Symphony 3.4	3.6000	3.5200	3.8300	4.4000	5.0000	20.3500	5.0000	H
BSITAC 8	Materials returning service	Materials management	Returning component	Symphony 3.4	3.2000	3.5200	3.8300	4.4000	5.0000	19.9500	4.4921	H
BSITAC 9	Hold placing service	Materials management	Hold placing component	Symphony 3.4	3.1000	3.5200	3.8300	3.6000	5.0000	19.0500	3.3492	M
BSITAC 10	Term deferral service	Term deferral management	Term deferral component	Banner 8.5.4	4.0000	3.2800	3.1500	3.4000	3.5000	17.3300	1.1651	L
BSITAC 11	Timetabling service	Timetabling management	Timetabling management component	Banner 8.5.4	1.5000	3.2800	3.1500	4.5000	5.0000	17.4300	1.2921	L
BSITAC 12	Examination information service	Examination information management	Examination information management component	Banner 8.5.4	3.1000	3.2800	3.1500	4.2000	3.5000	17.2300	1.0381	L
BSITAC 13	Attendance service	Attendance management	Attendance management component	Banner 8.5.5	2.9000	3.2800	3.1500	3.7000	4.5000	17.5300	1.4190	L
BSITAC 14	Academic record and certification service	Academic record and certification management	Academic record and certification component	Banner 8.5.6	2.5000	3.2800	3.1500	4.8000	3.5000	17.2300	1.0381	L

6.5 Stage 4: Evaluation and Recommendations of Business-Aligned IT Services and KPIs

This final stage of analysis addresses the impact of business service values, which are derived in Stage 2, on the R_B values of associated IT services, which are derived at the end of the previous stage. The aim is to determine the impact of the performance of the analysed set of business services offered by Albaha University on the value of IT services. Recommendations to enhance the set of analysed IT services are then established building on the outcomes from this stage and the previous stages of analysis. This is then followed by feedback to the board of management of Albaha University on the operational performance of the analysed set of offered services.

6.5.1 The Impact of Business Service Values on IT Services

Guided by the R_B values that are produced by the end of the previous stage, the *IT_Impact_Analysis* is conducted in three steps as follows:

Step 1: determine the impact results for each IT application component

The impact of business service values on IT application components is determined in this step. The Business Service Strategic Value (BSSV), Perceived Business Service Performance (PBSP) value and Business Service Efficiency (BSE) value are the business service values that are retrieved from business service profiles to assist in determining the impact results on IT application components. These business service values, along with the R_B values that are produced at the end of Stage 3, are used as parameters to determine the IT impact result for each IT application component analysed at Albaha University.

Three IT applications at Albaha University, incorporating 14 active IT application components, are integrated with corresponding business service values in an *IT_Impact_Analysis* (see Table 6.4). These integrations are then analysed, applying the decision criteria for impact analysis that were introduced in Table 5.2 (Section 5.5.1). Based on the decision criteria, the impact results for business-aligned IT application components are classified as *Maintain*, *Revise*, *Replace*, *Outsource* and *Remove*. For example, the impact result for the *borrowing component* from *Symphony 3.4* IT application in *BSITAC7* is categorised as *Maintain*. This is because of its high R_B value to the borrowing service, supported by high strategic importance of the business service itself, and a medium level of its performance based on its efficiency analysis and as it is perceived by its engaged students.

Table 6.4: Impact analysis of business values on ITACs

No	Business Service (BS)	IS Service (ISC)	IT Application Component (ITAC)	IT Application (ITA)	R_B value	R_B Category	BSSV	PBSP	Impact result
BSITAC1	Admission service	Admission management	Student admission component	Banner 8.5.4	2.7651	L	H	M	Replace
BSITAC2	Module enrolment service	Enrolment management	Module enrolment component	Banner 8.5.4	4.4667	H	H	M	Maintain
BSITAC3	Module withdrawal service	Enrolment management	Module withdrawal component	Banner 8.5.4	3.3238	M	M	H	Revise
BSITAC4	Module content delivery service	Module content delivery management	Content delivery component	Blackboard Learn 9.1.2	3.0317	L	H	M	Replace
BSITAC5	Assessment and feedback service	Assessment and feedback management	Assessment & feedback component	Blackboard Learn 9.1.2	1.0000	L	H	M	Replace
BSITAC6	Discussion and communication service	Communication management	Communications management component	Blackboard Learn 9.1.2	3.5397	M	H	M	Maintain
BSITAC7	Materials borrowing service	Materials management	Borrowing component	Symphony 3.4	5.0000	H	H	M	Maintain
BSITAC8	Materials returning service	Materials management	Returning component	Symphony 3.4	4.4921	H	H	M	Maintain
BSITAC9	Hold placing service	Materials management	Hold placing component	Symphony 3.4	3.3492	M	H	H	Maintain
BSITAC10	Term deferral service	Term deferral management	Term deferral component	Banner 8.5.4	1.1651	L	M	M	Outsource
BSITAC12	Examination information service	Examination information management	Examination information management component	Banner 8.5.4	1.0381	L	H	M	Replace
BSITAC13	Attendance service	Attendance management	Attendance management component	Banner 8.5.5	1.4190	L	H	M	Replace
BSITAC14	Academic record and certification service	Academic record and certification management	Academic record and certification component	Banner 8.5.6	1.0381	L	H	M	Replace

Another example of an IT impact result is shown in the *assessment and feedback component* from the *Blackboard Learn 9.1.2* application in *BSITAC5*, which is categorised as *Replace*. Although this component is supporting a critical business service to students and its users have positive attitudes towards the business service performance, the very low R_B value at only (R_B = 1.00) has contributed to this generated impact result. More specifically, the low level of usage of the assessment and feedback component, along with the low perceived value of its usability from relevant users, are influencing its overall R_B value.

The *module content delivery service* in *BSITAC4* represents one of the business and IT alignment complex scenarios that have been discussed in Section 5.4.1. This service is enabled through a collaboration between two IT application components from two different IT applications (i.e. *the module content delivery component* from *Blackboard Learn 9.1.2* and *module enrolment component* from *Banner 8.5.6*). This represents the interaction relationship that exists between these two IT applications to support one business service. Since the *module enrolment component* shows a high R_B value in supporting *module enrolment service*, it could mean that IT capabilities from the *module content delivery component* are the main reason why this component impact result is 'Replace'. The analysis of the collaboration between different IT application components for supporting related business services is beyond the scope of this research. However, this example is introduced in this section simply to reveal the complex relationships that can occur between business and IT services.

It is obvious in the IT impact analysis in Table 6.4 that none of the analysed IT application components are categorised to be *removed*. This is because the set of business services that are analysed at Albaha University are one of: customer core value-adding services, such as admission and module enrolment services; customer non-core value-adding services, such as term deferral; or primary business value-adding services, such as module content delivery. Therefore, IT application components supporting these core services cannot be simply recommended for removal. At this point of analysis, impact results for individual IT application components are determined. This then paves the way for observing a holistic view of these impact results on an IT application level.

Step 2: observe holistic impact results on individual IT applications

Impact results for individual IT application components are grouped in this step, based on related IT applications. The capability of a single IT application can then be presented through the ability of its components to enable and support aligned business services. Figure 6.19, Figure 6.20 and Figure 6.21 illustrate the impact results for the IT application

components of Banner 8.5.4, Blackboard Learn 9.1.2 and Symphony 3.4, respectively.

No.	IT Application (ITA)	Impact result
BSITAC1	Banner 8.5.4	Replace
BSITAC2	Banner 8.5.4	Maintain
BSITAC3	Banner 8.5.4	Revise
BSITAC10	Banner 8.5.4	Outsource
BSITAC12	Banner 8.5.4	Replace
BSITAC13	Banner 8.5.5	Replace
BSITAC14	Banner 8.5.6	Replace

Figure 6.19: Impact results for Banner 8.5.4 components

No.	IT Application (ITA)	Impact result
BSITAC4	Blackboard Learn 9.1.2	Replace
BSITAC5	Blackboard Learn 9.1.2	Replace
BSITAC6	Blackboard Learn 9.1.2	Maintain

Figure 6.20: Impact results for Blackboard Learn 9.1.2 components

No.	IT Application (ITA)	Impact result
BSITAC7	Symphony 3.4	Maintain
BSITAC8	Symphony 3.4	Maintain
BSITAC9	Symphony 3.4	Maintain

Figure 6.21: Impact results for Symphony 3.4 components

For the three analysed IT applications at Albaha University, none of them will be recommended to be removed since there is at least one IT application component within each IT application with *Maintain* as an impact result. Following the priority rules for IT applications' recommendations defined in Section 5.5.1 in Step 2, an IT application component with a maintain impact result has a higher priority than any other considerations. However, recommendations for individual components can still be made for this set of IT applications, which are discussed in the next step of analysis.

Step 3: propose recommendations for IT applications and IT application components

Recommendations for the enhancement of IT applications or IT application components must go along with the business strategies and objectives of Albaha University. Therefore, proposed recommendations based on the business-aligned IT analysis carried out at Albaha University through the B-ITAAM are tuned to enhancing the quality of teaching and learning services provided to students. This is to increase the level of satisfaction among students towards core services offered to them, which has been identified as a strategic concern for the university in Stage 1.

From the instantiation of B-ITAAM in Albaha University, the three analysed IT applications are recommended to be maintained not only because their components are supporting core business services and the university has invested large amount of money in them, but also because some components within each of these applications have shown effectiveness in enabling related business services. However, for those components that turned out to be

ineffective through the B-ITAAM analysis, recommendations are specifically proposed by referring back to the reasons that have caused ineffectiveness. The causes can be business or IT related, as depicted in Table 6.5, which provides a set of recommendations for enhancing business and IT aspects that are analysed at Albaha University. Although these recommendations do not match with the impact results suggested in Table 5.2 in Section 5.5.1, they aim to exploit the existing capabilities of IT applications and also to enhance the aspects that lead to such impact results so that these IT capabilities can deliver business value.

The university is running on a low budget compared with the previous two years, so the replacement and outsourcing of IT applications or IT application components are highly unlikely to be considered as options. Given the fact that the set of analysed business services at Albaha University have only been analysed in one school, it is also unlikely that proposed recommendations would result in significant changes to the IT portfolio.

Table 6.5: Proposed recommendations for leveraging the business value of IT components at Albaha University

No	IT Application Component (ITAC)	Business Service (BS)	Impact result	Proposed recommendations
BSITAC1	Student admission component	Admission service	Replace	Enhance BSE, ITQ and UPV
BSITAC2	Module enrolment component	Module enrolment service	Maintain	Maintain
BSITAC3	Module withdrawal component	Module withdrawal service	Revise	Increase ITU and enhance ITQ
BSITAC4	Content delivery component	Module content delivery service	Replace	Increase awareness of ISC, and ITU
BSITAC5	Assessment & feedback component	Assessment and feedback service	Replace	Increase awareness of ISC, and ITU
BSITAC6	Communications management component	Discussion and communication service	Maintain	Maintain
BSITAC7	Borrowing component	Materials borrowing service	Maintain	Maintain
BSITAC8	Returning component	Materials returning service	Maintain	Maintain
BSITAC9	Hold placing component	Hold placing service	Maintain	Maintain
BSITAC10	Term deferral component	Term deferral service	Outsource	Increase awareness of ISC, enhance ITQ and ITU
BSITAC11	Timetabling management component	Timetabling service	Not processed*	Enhance BSE and enhance UPV
BSITAC12	Examination information management component	Examination information service	Replace	Enhance ITQ and UPV
BSITAC13	Attendance management component	Attendance service	Replace	Enhance ITQ and UPV
BSITAC14	Academic record and certification component	Academic record and certification service	Replace	Enhance ITQ and UPV

* Not processed in IT impact result analysis due to low BSE and low PBSP values.

For ITACs that have '*Maintain'* as impact results, the proposal is to not modify them as they

already show effective support to related business services through the B-ITAAM analysis. Examples include *BSITAC2, BSITAC6, BSITAC7, BSITAC8 and BSITAC9.* However, other components are to be '*Revised'*, '*Replaced'* or '*Outsourced'*. Since these impact results cannot be implemented at the university for the above mentioned strategic reasons, recommendations to leverage the business value of IT components, based on the analysed business and IT factors, are devised, documented and communicated with the university decision-makers so that actions can be taken.

The *admission component* in *BSITAC1*, for example, is recommended to be replaced in the impact analysis. However, since the main IT application *Banner 8.5.4* cannot be replaced and the factors that influence this component can be tracked, enhancing these factors seems reasonable and logical with regards to exploiting the capability of the IT component to effectively enable the admission service. The technical quality problems of some aspects in Banner 8.5.4 have caused the admission service efficiency to be low. This then leads students to perceive the admission component to be ineffective in supporting their admission requirements. Working out these technical quality issues would ensure better alignment results between the admission component and the admission service.

Another example is *BSITAC5,* the *assessment and feedback component,* which is also recommended to be replaced. Factors influencing this decision include a low ISC value and low UPV at 3.5 and 3.2, respectively. The former, according to the head of the e-learning department at Albaha University, resulted because there is little awareness of the capability of Blackboard among students and academic staff for performing assessment and feedback online. This then affects the latter Users' Perceived Value of this component for assessment and feedback. This is similar to *BSITAC4*: the impact result of this *module content delivery component* is affected by low ISC and UPV. Interestingly, a similar component is found to offer the same content delivery functionality more effectively in Banner 8.5.4, with *Maintain* as an impact result. It is now up to the university decision-makers to either increase awareness of Blackboard and enhance its usage level among stakeholders or consider the content delivery component provided by Banner 8.5.4 to be the one that replaces Blackboard's similar component.

These examples illustrate that the analysed factors through B-ITAAM can always be referred to once it becomes challenging to reach a clear decision about an IT application resource. An enhancement in one or few of these factors can lead to significantly better utilisation and exploitation of IT application capabilities at the university and, therefore, better alignment between business and IT services. The set of proposed recommendations are then

documented in the Business Context Analysis along with the outcomes of the KPI monitoring analysis that is discussed next.

6.5.2 Feedback on Analysed set of KPIs

The set of Key Performance Indicators (KPIs) that guides the analysis in the B-ITAAM at Albaha University and links the daily performance of core business services to the university strategies is listed in Figure 6.22. Each KPI is mapped to related business services, allowing for a monitoring of the performance of these services that are offered by the university. The set of criteria and measures that are defined to monitor these KPIs are listed in Figure 6.22, along with the outcomes, as percentages, of dissatisfaction for each measure. These criteria and their outcomes are retrieved from the pilot survey that was conducted by the researcher between the periods of January to April 2015, which reveals that the overall level of satisfaction among students from the school of CS and IT at Albaha University towards the quality of provided academic and management services is poor at only 54.8% (Appendix C) (this questionnaire is discussed in Section 6.2.1).

Besides the recommendations that have been drawn and provided to the university to enhance the set of analysed business and IT services and their level of alignment, B-ITAAM extends its capability to provide a real-time view of the operational performance through its analysis techniques. This is achieved through the links that have been established in the first stage of the alignment analysis, where KPIs are mapped to related business services that have direct or indirect influence on the desired values of these KPIs.

Mapping KPIs to related business services				
KPIs	Assessment criteria		% of dissatisf action	Business services synced to this KPI
KPI6. Students' satisfaction with the quality of teaching and learning.	Good teaching	Staff are good at explaining things.	33.4	**BS4: Module content delivery.** *BSE: H* *PBSP: M* *UPV: H* **BS5: Assessment and feedback.** *BSE: M* *PBSP: M* *UPV: L* **BS6: Discussion and communication.** *BSE: M* *PBSP: M* *UPV: H* **BS12: Examination.** *BSE: H* *PBSP: M* *UPV: L*
		Staff have made the subject interesting.	44.1	
		Staff are enthusiastic about what they are teaching	34.4	
		The course is intellectually stimulating.	45.2	
	Appropriate assessment	The criteria used in marking have been clear in advance.	23.7	
		Marking and assessment has been fair.	31.2	
		Feedback on my work has been prompt.	34.4	
		I have received detailed comments on my work	36.6	
		Feedback on my work has helped me clarify things I did not understand	31.2	
	Quality of academic support	I have received sufficient advice and support with my studies	34.4	
		I have been able to contact staff when I needed to	24.7	
		Good advice was available when I need to make study choices	40.9	
	Organisatio n and	The timetable works efficiently as far as my activities are concerned	41.9	

	managemen t	Any changes in the course or teaching gave been communicated effectively	36.6		
		The course is well organised and is running smoothly	42		
	Quality of learning resources	The library resources and services are good enough for my needs	43		
		I have been able to access general IT resources when I needed to	38.8		
		I have been able to access specialised equipment, facilities, or rooms when I needed to	45.1		
	Emphasisin g independent learning.	The course has helped me to present myself with confidence	30.1		
		My communication skills have improved	25.8		
		As a result of the course, I feel confident in tackling unfamiliar problems.	25.8		
	Course content and structure	All of the compulsory modules are relevant to my course	31.2		
		There is an appropriate range of options to choose from on my course	37.7		
		The modules of my course form a coherent integrated whole	34.5		
	Course delivery	Learning materials made available on my course have enhanced my learning	38.8		
		The delivery of my course has been stimulating	50.5		
		My learning has benefited from modules that are informed by current research	26.9		
		Practical activities on my course have helped me to learn	32.2		
KPI22. Students' satisfaction with provided academic and managemen t services.	Welfare resources, services and facilities	Sufficient provision of welfare and student services that meet students' needs	52.7	**BS1: Admission.** *BSE: L PBSP: M UPV: L* **BS2: Module enrolment** *BSE: H PBSP: M UPV: H* **BS3: Module withdrawal** *BSE: H PBSP: H UPV: H* **BS7: Materials borrowing** *BSE: H PBSP: M UPV: M* **BS8: Materials returning** *BSE: H PBSP: M UPV: L*	**BS9: Hold placing.** *BSE: H PBSP: H UPV: L* **BS10: Term deferral.** *BSE: H PBSP: M UPV: H* **BS11: Timetabling.** *BSE: L PBSP: L UPV: L* **BS13 Attendance.** *BSE: H PBSP: M UPV: L* **BS14: Academic record and certification.** *BSE: L PBSP: M UPV: L*
		The library resources and services are good enough for my needs	43		
		The timetable works efficiently as far as my activities are concerned	41.9		

Figure 6.22: KPIs monitoring through a pilot survey and the outcomes of the B-ITAAM

Comparing the outcomes of the pilot survey and the B-ITAAM, results from the B-ITAAM show significant improvements in the *content delivery service* (BS4) at the school of CS and IT. From a high level of dissatisfaction among students, at 50.5% in January 2015, students rate the content delivery in September 2016 as Medium and the IT component that supports

this service as High. However, the *timetabling service* (BS11) still shows a low level of performance, which affects the overall KPI value of students' satisfaction about provided services. In the pilot survey, the level of dissatisfaction of students about timetabling service efficiency was high at 41.9%. In the analysis during the case study in September 2016, the Business Service Efficiency (BSE) of the timetabling service, its performance as perceived by students (PBSP) and the effectiveness of the IT component to support the service (UPV) are all *Low*. The set of business services that have been analysed at Albaha University through the B-ITAAM and show low levels of efficiency or effectiveness are documented in the Business Context Analysis as services that cause violation to related KPIs. This allows accountability to the causes and sources of the violations of these indicators to be established and tracked.

Figure 6.23 shows the Business Context Analysis of Albaha University after the documentation of proposed recommendations to enhance the university operational performance and alignment, and also the documentation of the set of business services that cause violations of KPIs. This then indicates the end of a single evaluation process through the B-ITAAM.

<table>
<tr><th colspan="4">Business Context Analysis</th></tr>
<tr><td>Organisation name: Albaha University – school of CS and IT</td><td>Date: 10 OCT 2016</td><td colspan="2">Version No: 1.0</td></tr>
<tr><td>Organisational Aspects</td><td>Document reference</td><td>Key aspects</td><td>Theme under assessment/ KPIs</td></tr>
<tr><td>Description of the organisation</td><td>BHU.36.2015
BHU.37.2016</td><td>Background info</td><td rowspan="15">Theme:
Student satisfaction about teaching, learning and management services.

KPI6. Students' satisfaction with the quality of teaching and learning.

KPI22. Students' satisfaction with provided academic and management services.</td></tr>
<tr><td>Vision and mission</td><td>BHU.SP 1-5</td><td>Message and ambitions</td></tr>
<tr><td>Critical Success Factors</td><td>BHU.SP 1-5</td><td>Competences</td></tr>
<tr><td>Business strategy</td><td>BHU.SP 1-5</td><td>Goals and objectives</td></tr>
<tr><td>IT strategy</td><td>BHU.SP 1-5</td><td>IT plans</td></tr>
<tr><td>Code of practice</td><td>BHU.Rules.2016</td><td>Rules and regulations</td></tr>
<tr><td>Historical facts</td><td>BHU.36.2015</td><td>Foundation of the HEI; figures and facts</td></tr>
<tr><td colspan="3">Business structure</td></tr>
<tr><td>Organisational structure</td><td>BHU.36.2015
BHU.37.2016</td><td>Power hierarchy</td></tr>
<tr><td>Strategic units</td><td>BHU.37.2016</td><td>Key decision-makers</td></tr>
<tr><td>External stakeholders</td><td>BHU.SP 1-5</td><td>External influence</td></tr>
<tr><td colspan="3">Financial overview</td></tr>
<tr><td>Statement of cash flows</td><td>BHU.36.2015
BHU.37.2016</td><td>Financial state</td></tr>
<tr><td>Income statement</td><td>BHU.36.2015
BHU.37.2016</td><td>Financial state</td></tr>
<tr><td>Statement of financial position</td><td>BHU.36.2015
BHU.37.2016</td><td>Financial performance</td></tr>
<tr><td colspan="4">Recommendations and feedback</td></tr>
</table>

Proposed recommendations to analysed business services	- *Enhance business service efficiency and effectiveness of {BS1, BS11 and BS14}.* - *Increase awareness about the offerings of {BS4, BS5 and BS10} through IT.*
Proposed recommendations to analysed IT services	- *Decide module content delivery to be either through Blackboard or Banner. The former shows less relative benefit value compared with the latter.* - *Enhance technical quality aspects of {Banner 8.5.4 and Symphony 3.4}.* - *Enhance users' perceived values of {ITAC1, ITAC5, ITAC12, ITAC13 and ITAC14}.* - *Increase level of usage of {ITAC5}.*
Feedback on KPIs	- *BS5 and BS12 are violating optimal value of KPI6.* - *BS1, BS8, BS11, BS13 and BS14 are violating optimal value of KPI22.*

Figure 6.23: The business context analysis of Albaha University after implementing the B-ITAAM

Proposed recommendations to enhance the set of analysed business and IT services at Albaha University aim to optimise these services so as to increase students' level of satisfaction towards the quality of offered academic and management services. This has been flagged as a serious strategic concern to the university, requiring urgent action to be taken. The university should then be able to improve its core provided services and enhance its KPI values once actions are taken against the outcomes of the B-ITAAM. Through careful strategic and operational consideration of the core business services offered at Albaha University, no major changes will be recommended for any of the analysed IT services; that is, none should be *Replaced*, *Outsourced* or *Removed* for the following reasons:

First, the IT applications that have been analysed at Albaha University are unique, providing support to either core academic or management services. Through a severity impact analysis, two of the three IT applications are found to have severe negative impact on the university if they fail to perform as required (i.e. Banner 8.5.4 and Symphony 3.4). Therefore, replacing an IT application or an IT application component becomes impossible in most cases. Luckily, we found that both Blackboard and Banner provide module content delivery capabilities and we suggested Banner to replace Blackboard until awareness of Blackboard offerings increases.

Second, the university board of management is not planning to make any IT investments in the near future, nor to replace any of the existing IT resources with new ones, justifying this by the huge IT investments that were made on Blackboard and Banner, as indicated in the IT repository, and also due to the shortages in the 2017 budget. For the outsourcing recommendation, these reasons are also applicable.

Finally, none of the IT applications or IT application components are recommended to be totally removed because they are supporting core business services at the university and have not been assessed at the university level, which makes it difficult to recommend these IT resources for removal while they support critical services elsewhere at the university. Some

components also show high levels of effectiveness in supporting related business services and this makes it difficult to recommend the whole IT application for removal. These reasons have led to the adoption of the optimisation and exploitation approaches of the values derived from the B-ITAAM, so as to devise recommendations to enhance business and IT capabilities at Albaha University to thereby enhance the status of business-aligned IT.

At the end of this last stage of analysis, recommendations to the set of analysed business and IT services at Albaha University are proposed, aiming to enhance these university core services offered to all of its students in general, and to the students of the school of CS and IT in particular. Feedback to the university board of management on the set of business services that are currently causing violations to students' satisfaction KPIs is also provided. These recommendations and feedback are summarised in Figure 6.24 as a final set of results produced by the analysis techniques of B-ITAAM.

B-ITAAM as a methodological solution to evaluate the alignment between business and IT is implemented at Albaha University with the intention of enhancing the alignment between business and IT services to ***increase students' level of satisfaction towards the quality of offered academic and management services***. For this objective to be achieved, the following recommendations should be considered:

1. The performance of these business services (i.e. admission, timetabling, academic record & certification) should be enhanced to realise better business value from IT.
2. The three analysed IT applications (i.e. Banner 8.5.4, Blackboard Learn 9.1.2 and Symphony 3.4) are recommended to be maintained in the meantime not only because their components are supporting core business services and the university has invested a large amount of money in them, but also because some components within each of these applications have shown effectiveness in enabling related business services.
3. Considering the low operational budget of the university this year compared with the previous two years, no recommendations are made which require new IT investments.
4. Awareness should be increased among students and academic staff that module content delivery, assessment & feedback and term deferral services can be offered through existing IT solutions.
5. Content delivery through Banner shows a higher relative benefit value than content delivery through Blackboard. It is recommended that only one of them should be considered as a platform for content delivery to save IT costs and enhance alignment.
6. The technical quality of Banner and Symphony should be improved through the revision of the technical aspects that negatively affect the performance of these two IT applications.
7. Users of these IT components (admission, assessment & feedback, examination, attendance, and academic record & certification) are not satisfied with them to support their business activities. Causes of this dissatisfaction should be tracked and dealt with.
8. The assessment & feedback component should be used more frequently by stakeholders.
9. Among 4 business services synced with *KPI6: students' satisfaction with the quality of*

teaching and learning, the assessment & feedback and examination services appear to negatively affect this KPI.

10. Among 10 business services synced with *KPI22: students' satisfaction with provided academic and management services*, the admission, material returning, timetabling, attendance, academic record & certification services appear to negatively affect this KPI.

Figure 6.24: Summary of final set of results produced by B-ITAAM and shared with Albaha University

Addressing these recommendations can significantly lead to a better utilisation and exploitation of IT capabilities at the university and, therefore, to a better alignment between business and IT services. Having also other schools at the university similarly assessed would provide a clearer view of business and IT alignment in the university and, therefore, assist in the derivation of more sensible recommendations to enhance offered business and IT services.

6.6 Summary

The application of the B-ITAAM to a real-life case study is carried out in this chapter. Through the application, the instantiation of the business analysis techniques defined in the B-ITAAM is clearly demonstrated. This validates the use of the B-ITAAM as a methodological solution to evaluate the alignment between business and IT services at the operational level of organisations. The instantiation process carried out at Albaha University, through the B-ITAAM, reveals important facts about the performance and the capability of business services and supporting IT resources. The derivation process of recommendations based on these facts then feeds back to improve business services that are offered at the university in general and at the school of CS and IT in particular.

More specifically, the alignment of fourteen core business services offered at Albaha University and their supporting IT services is examined guided by strategic concerns of low level of students' satisfaction towards the quality of these services. The outcomes reveal that 5 IT services are satisfactorily adding business value to aligned business services and, therefore, they are recommended to be maintained. Other IT services are recommended to be revised (1); replaced (6) and outsourced (1) to have better state of business-aligned IT. However, the replacement and outsourcing recommendations of these IT services are highly unlikely to be implemented since the university is running on a low budget compared with the previous two years.

The business and IT misalignment at Albaha University are mainly caused by either poor performance of business services or low level of users' perceptions and underutilisation of

IT services. For example, the admission, timetabling, academic record & certification services are perceived by students to be of low level of performance. The performance of these business services must be enhanced first in order to realise better business value from aligned IT resources. On the other hand, users of these IT services (i.e. admission, assessment & feedback, examination, attendance, and academic record & certification) are not satisfied with these services to support their activities. Other IT services such as content delivery, assessment & feedback are found to be underutilised across the university. The university is then provided with a list of recommendations that specifies which business and/or IT service that should be enhanced and why. The aim is to help the university to achieve better state of business-aligned IT, which would subsequently improve the quality of offered services at the university.

The application of the B-ITAAM in Albaha University also sheds some light on the complexity of business and IT alignment and its assessment in the higher education sector. This sector has received less theoretical and practical IT alignment research than many other public and private sectors. The main complexity is represented in the difficulty of carrying out a comprehensive business and IT alignment assessment while also taking all schools and stakeholders of the university into account. The utilisation of the same IT resource differently by many schools and departments at the university represents another complexity with regards to effective business and IT alignment assessment and derivation of recommendations for enhancing this alignment.

The following chapter builds on the findings to perform a critical evaluation and validation of the B-ITAAM, where the contributions and limitations of this research are also introduced.

Chapter 7
Critical Evaluation

This chapter critically evaluates the Business and IT Alignment Assessment Method (B-ITAAM) that is developed in this research as a methodological solution for assessing business-aligned IT at the operational level of organisations. First, the content and outcomes of the B-ITAAM, based on its development process and its application in a case study, are evaluated by a board of experts from Albaha University. The contributions made by this entire research to the theories and practices of business and IT alignment and its assessment are then discussed. Finally, the limitations of this research, which can be potentially addressed in future work, are revealed.

7.1 Validating B-ITAAM through Experts' Feedback

B-ITAAM is not the definitive solution to the assessment of business-aligned IT services at the operational level of organisations. Therefore, in addition to its evaluation in an in-depth case study, a content validation approach is developed to verify whether it behaves as expected and becomes a possible solution for addressing the alignment assessment based on experts' viewpoints (Finlay, 1989). The B-ITAAM is then validated through appraisals captured from nine IS/IT experts from Albaha University, each of whom holds the rank of assistant professor or above. Five of them, besides being academics at the school of CS and IT, are also working at the university IT centre. Four of the nine are familiar with the research objectives and approach since they have already provided feedback during the development stage of the method through an open-ended questionnaire (Appendix B).

A presentation through Skype was given to these experts to explain and discuss the B-ITAAM and its techniques through the data that was collected from the university. The outcomes from the application of the method in Albaha University are also presented. Experts are then asked to evaluate the method's feasibility, usability and usefulness through an open-ended questionnaire (Appendix D). Figure 7.1 illustrates the experts' level of satisfaction in relation to each of these three aspects.

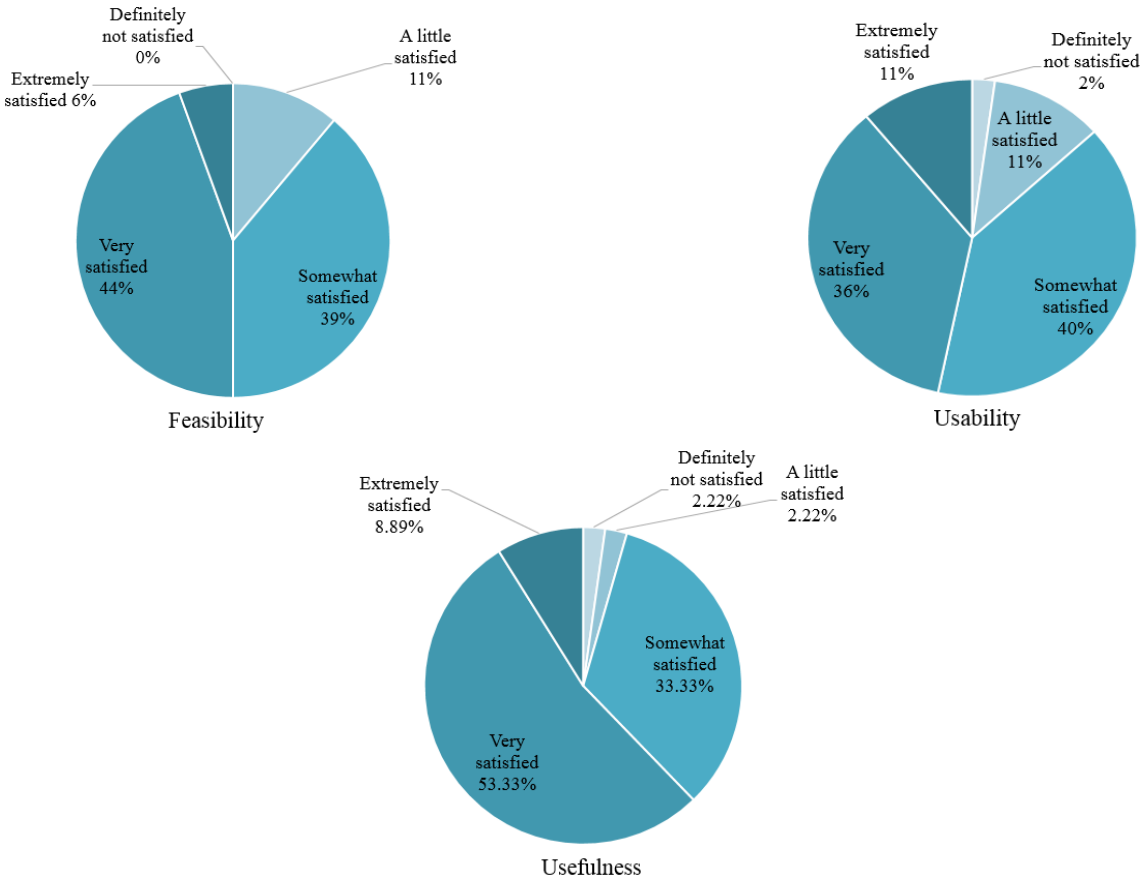

Figure 7.1: The feasibility, usability and usefulness of B-ITAAM as evaluated by experts from Albaha University

Regardless of the overall positive appraisal in returned questionnaires, some criticisms have been made. Experts mostly agree that B-ITAAM is feasible for application in real-life cases following the successful implementation of the method in Albaha University. They also show positive attitudes towards the timing and provisioning of information during the transitions between business analysis techniques and stages of analysis defined in B-ITAAM. However, some experts pointed out that only specialists would be able to use this method in real-life scenarios. Two experts also indicate little satisfaction with the feasibility of B-ITAAM, but without giving any further reasons.

In terms of the usability of the B-ITAAM, experts show moderate to high levels of satisfaction towards the clarity of the business analysis tools defined in the method and its ability to decompose and recompose complex business-aligned IT services for alignment assessment. They also appreciated the ability to enter any stage of the alignment assessment where needed and the ability to add more factors to the method to extend its use if required. However, they argued about the ease of use of the method in real-life cases. One of the experts commented that '*a large team might be required in order to apply and realise the benefits of this method in a large-scale business IT alignment assessment*'. Another expert

commented that '*it may take time and effort to realise the outcomes of this method*'. Although it may not seem easy to apply the method in real-life scenarios as the experts indicated, the method is addressing a complex business and IT alignment issue that faces IT managers guided by critical strategic concerns to provide facts from multiple perspectives that aim to improve business performance so as to better meet business goals. This may have influenced the ease of the method with regards to practical application.

Finally, the usefulness of the B-ITAAM is also appraised by experts. They totally agree that B-ITAAM serves the purpose of assessing business and IT alignment at the operational level of an organisation. They also appreciate the usefulness of the link that has been established between the strategic and operational levels in the method to guide the alignment assessment towards business and IT services that are of strategic importance to the organisation. Experts also found the outcomes from the application of the B-ITAAM in Albaha University to be useful and of good quality to the university, reflecting not only on the business and IT alignment status of analysed services, but also on the operational performance of the school of CS and IT in core teaching and learning services. In a question related to the generalisability of the B-ITAAM, some experts show high levels of satisfaction about the possibility of using B-ITAAM in other contexts. However, the majority are either little satisfied or not satisfied about the generalisability of the method and argue that other confirming case studies must be carried out first in other sectors before the generalisability can be determined.

The acceptance of the developed method by experts from Albaha University ensures not only its content validity, but also its construct validity, where the business analysis techniques defined in the B-ITAAM move together as a whole to assess business-aligned IT services in an organisational operation and provide recommendations that aim to enhance business performance. Contributions made by this research following the design and application of the B-ITAAM are discussed in the next section.

7.2 The Research Contributions to the Theory and Practice of Business and IT Alignment

The combination of existing theories and methodologies in a novel approach that aims to establish and evaluate business and IT alignment at an organisational operation, driven by strategic motives, is achieved in this research. The application of this approach in a case study in a higher education instituting is also carried out and presented. These have contributed to the knowledge body and practice of business and IT alignment.

7.2.1 Research Contribution to Business and IT Alignment Theories

The contributions to the theory of business and IT alignment can be summarised under two main headings.

Robust approach for business and IT alignment evaluation

Previous business and IT alignment assessment research addresses the evaluation of business and IT alignment at the operational level from either tangible or intangible perspectives. The lack of an integrated method that combines the tangible with the intangible perspectives to provide a holistic evaluation for the business and IT alignment value is addressed in the work of Sun et al. (2014). This is believed to provide one step ahead in an attempt to determine the true value of business and IT alignment. This multidisciplinary research has embraced the approach of Sun et al., but with more balance among the set of tangible and intangible factors from both business and IT domains as determinant factors to derive the value of business and IT alignment at the operational level.

This research then studies the interconnection of two major knowledge domains: business and IT. The aim is to exploit existing knowledge from these domains so as to present them in an innovative integrated Business and IT Alignment Assessment Method (B-ITAAM) that represents a theoretical contribution to the knowledge body of business and IT alignment assessment. B-ITAAM comprises a set of business analysis techniques that assist with establishing alignment between business and IT services and then carrying out an assessment of this alignment.

The alignment is established by a holistic presentation of business and IT elements at the operational level of an organisation. This is supported by a set of theories that include Socio-Technical Systems theory, Organisational Semiotics, Service-Oriented theory and Enterprise Architecture theory. Socio-Technical Systems theory describes the social behaviour and the technicality aspects of business and IT elements in the organisation. This theory is further supported by Organisational Semiotics theory to assist with articulating formal and informal rules that exist in an organisational operation and influence the level of alignment between business and IT. Service-Oriented theory provides the principles for the representation of business operations and IT resources as independent services that can be composed accordingly. Finally, Enterprise Architecture theory provides service-oriented viewpoints of business and IT architectures and reflects on the integration of these architectures.

The independent description of business and IT services supports clear understanding of their involved elements and therefore a logical alignment and assessment can be established.

The alignment is then supported by Task Technology Fit (TTF) principles which reflect on the linkages between business tasks and IT capabilities. However, since TTF does not have a mechanism to determine the degree of this fit, Social Exchange Theory is adopted to represent the relative benefit values of IT services to related business services through a set of integrated tangible and intangible factors. These factors are found in the literature to have influence on the level of alignment between business and IT.

Linking the strategic level of an organisation with the operational level through KPIs is a key feature in the B-ITAAM. It not only guides the business and IT alignment assessment process to be focused on core strategic services, but also allows a comprehensive business-aligned IT analysis to feed back to the strategic level of an organisation with a list of business and IT services that are violating desired values of KPIs.

Understanding of business and IT alignment in higher education sector

B-ITAAM addresses recent calls in the literature to pay more attention to the issue of business and IT alignment in the higher education sector, which does not receive proper theoretical nor practical attention in the IT alignment research. Although B-ITAAM is only applied in a single case study from this sector, it improved understanding of the challenges that face comprehensive business and IT alignment assessment in this sector once social perspectives are taken into consideration. These challenges are presented in the following points.

First. Core business services provided in this sector, such as teaching services that include content delivery, assessment and feedback, can be offered differently from one school to another. For instance, delivering a module in a lecture hall is different from delivering one in a lab or in the field. This makes it difficult to have a standardised intensive approach of evaluating the efficiency and the effectiveness of business services offered at an institutional level. Although some aspects might be shared among offered services, customised evaluation techniques per school or even per module are necessary to ensure comprehensive assessment of the performance of these services. This is a critical step that needs to be achieved before any IT assessment can be established for business-aligned IT evaluation.

Second. The level of criticality of an IT capability to support the same business service across different schools can be different. For example, while it is extremely critical to have IT support for delivering content in the school of computer science, it may not be critical in the school of education and delivering content in an old-fashioned way may be preferable. This affects a proper assignment of IS Service Capability (ISC) value at an institutional level,

which is considered an important tangible factor that influences the value of business and IT alignment.

Third. IT applications supporting core business services offered in this sector are usually used by more than one type of stakeholders (e.g. students, academic staff, programme coordinators, employees, etc.). This makes the consideration of all stakeholders' perceived values towards an intensive assessment of an IT application a challenging objective. An IT application that is perceived acceptable by academic staff for performing their academic tasks may not meet students' expectations to perform their tasks. This requires a comprehensive perceived performance assessment of all targeted users of an IT application before a decision about an IT application can be made.

Fourth. Different schools within the same institution may utilise the same IT application differently. This means that, for one school, the majority of the capabilities provided by an IT application may be exploited, while this may not be the case in another school. This affects the level of usability of an IT application as an important factor that influences the level of alignment between business and IT, and also makes it challenging to assign a single usability value at an institutional level.

However, in this sector, many HEIs worldwide have established metrics to measure operational performance at a school and/or module level. The outcomes of such metrics can be used towards business and IT alignment assessments to reflect on the performance of business services. This will assist the expedition of the B-ITAAM process once this data is made available. In addition, the ability of HEIs to effectively assess their operational performance through the B-ITAAM can help them to distinguish their competencies, which can lead to the co-creation of value with other HEIs in the higher education ecosystem. Digital business ecosystems have recently been observed to influence business and IT alignment research and B-ITAAM can be seen to provide the initial step towards a clear awareness of internal business capabilities.

The application of the B-ITAAM in the HE sector is aimed at extending knowledge of business and IT alignment and its assessment in this sector. Moreover, the knowledge embodied in the B-ITAAM techniques represents a significant outcome that aims to solve business problems and promotes further improvement and knowledge sharing in the field of IS. This achievement overcomes isolated approaches that cannot address the core of the research problem.

7.2.2 Contributions of B-ITAAM to Business and IT alignment Assessment Practices

B-ITAAM in itself is a contribution to the business and IT alignment assessment practices in virtue of being a methodological approach for carrying out the alignment assessment process. The significance of this approach is that besides its exploitation of existing knowledge, it is exercised in a real-world case study and receives feedback during its development and after its application from IS/IT experts. This links the scientific research of business and IT alignment with real-life practices to produce this evaluation tool.

B-ITAAM contributes a set of business analysis techniques in a combined tool that enables consultants to systematically determine the current state of business and IT alignment at the operational level of an organisation. Besides that, it enables consultants to determine how business services are being executed with respect to a defined set of business goals. This is achieved through the links that are established between strategic and operational levels in the B-ITAAM through KPIs.

B-ITAAM enables a holistic business and IT alignment assessment at the operational level of an organisation through the analysis of a set of tangible and intangible factors that influence this alignment. This fusion of tangible and intangible factors supports the generation of a holistic value for business and IT alignment, which enables further recommendations to be drawn to enhance business performance. Besides the identified and examined list of influencing factors, consultants can integrate more factors into the B-ITAAM. This is due to the flexibility of the B-ITAAM, which allows new factors and techniques to be imported into the method without redesigning it.

Based on the findings from the critical evaluation of the B-ITAAM and also the responses received from IS/IT experts from Albaha University, B-ITAAM provides a seamless process of business and IT alignment assessment through a multi-stage analysis that provides the right information at the right time to address the chaotic business and IT alignment environment at the operational level of organisations. Facts generated at each stage are documented through a referencing mechanism that enables management, organisation and future retrieval of the results that are produced during the analysis stages.

The contribution of B-ITAAM to the practice of business and IT alignment illustrates the value of this research to address a real-world problem, which requires not only an understanding of the problem but also a solution to resolve it. This conforms to the objective of information systems research that is guided by Design Science Research, which aims to

devise an artefact that resolves heretofore unsolved problems. However, B-ITAAM is not claimed to be perfect and there is a need for its continuous enhancement. The enhancement is essential for ensuring that B-ITAAM is still relevant in rapidly evolving business and IT environments. The challenges faced during this research that cannot be addressed are considered as limitations, which are introduced in the next section.

7.3 Limitations of the Research

There are some challenges that have been encountered during this research which could not be completely addressed due to time and resource constraints. These challenges are considered as limitations which could be addressed in future work. The limitations of this research can be summarised as follows.

A single case study for the evaluation of B-ITAAM

A single in-depth case study from a higher education institution is applied in this research as the data source for the analysis and evaluation of B-ITAAM. Although it has previously been justified that a single case study is sufficient and suitable to present the value of this research, it would be more useful if multiple case studies are conducted in order to reveal the strengths and weaknesses of B-ITAAM towards future research. This would also enable comparisons to be established of how B-ITAAM behaves in different contexts and scenarios, which may derive further significant outcomes that can lead to further improvements of B-ITAAM. During the early stages of this research, the researcher tried to gain permissions from multiple Saudi universities to at least ensure the generalisability of B-ITAAM in the Saudi higher education context, but unfortunately permissions were not granted. The researcher then acknowledges the limitation of a single case study evaluation which impeded the generalisability of B-ITAAM as a business and IT alignment assessment tool to be applied in any other organisation's operational level.

Not all targeted users of analysed IT applications are considered in the analysis of users' perceived value

Users' perceived value towards the usability and usefulness of IT applications to support daily activities is considered an important intangible factor that influences the value of business and IT alignment. However, in the application of B-ITAAM, perceptions were only retrieved from students, whereas analysed IT applications are used by more than one type of stakeholders, including students, academic staff, course coordinators and employees. This approach can be justified for two reasons. First, the whole business and IT alignment

assessment carried out in Albaha University is triggered by and aimed at improving students' satisfaction towards core offered services and this requires more focus to be placed on students' perceptions. Second, the three analysed IT applications (i.e. Banner 8.5.4, Blackboard Learn 9.1.2 and Symphony 3.4) are further divided into 14 IT application components, which require customised sets of questionnaires to be designed, distributed to students and monitored for each IT application component. This approach was undertaken in order to ensure close monitoring of the IT components that outperform other components within a single IT application. This would be more challenging if all stakeholders' perceptions were analysed. Analysing students' perceptions towards IT applications at Albaha University was sufficient for producing findings that address a critical university problem and improve core offered services' performance. However, taking into account the perceptions of all targeted users of an IT application would increase awareness of how different stakeholders perceive an IT application to support business activities. This would enable more sensible recommendations to be made for an IT application.

Costing aspects of IT applications are not totally addressed as tangible factors influencing the value of business and IT alignment

Although financial gains from the effective implementation of IT solutions in a business are considered in the assessment of business-aligned IT to reflect on the profits benefited from the acquisition of IT applications, other costing aspects of IT resources that include purchasing costs, maintenance costs, licencing and changing costs are not addressed. These costing aspects are known to affect business operations and the alignment between business and IT. Although costing information for the analysed set of IT applications in Albaha University is captured and documented in the created IT repository, the impact of these costs on the outcomes of the business and IT alignment assessment are not addressed in B-ITAAM. This is because IT applications are further divided into components to assess the level of alignment of these components with corresponding business servicers and these costing aspects cannot be broken down per component. This has been considered as a limitation in the B-ITAAM and therefore is an area to address in future work.

IT infrastructure as an influencing factor that affects the level of alignment between business and IT

IT and IS experts from Albaha University pointed out the importance of having a robust Information Technology infrastructure in order to enable effective business and IT alignment. Although the technical capability of IT applications is assessed in the B-ITAAM to reflect on the quality of these applications from a technical perspective, a full assessment

of the university IT infrastructure, including network resources, storage and hardware, is out of the scope of this research. This is considered a limitation of this problem-solving research since experts from the university (i.e. the problem domain) strongly believe that IT infrastructure has a strong influence on the level of alignment between business and IT.

7.4 Summary

B-ITAAM, as a business-aligned IT assessment solution, presents the techniques and measures for the alignment assessment process, while its utilisation in a case study reveals how this assessment can be methodologically conducted. This chapter conducted a critical evaluation of the research process by pointing out the strengths and limitations of the B-ITAAM. In this, the development of the B-ITAAM, based on the integration of sound underpinning theoretical and methodological approaches, is critically evaluated to justify its applicability and viability for utilisation as a mechanism to assess business-aligned IT. The application of B-ITAAM in a real-life case study in a higher education institution is also evaluated, which confirms the relevance and the value of this research to address a real-world problem.

The alignment assessment process defined in B-ITAAM and the outcomes from its application are evaluated for feasibility, usability and usefulness by nine experts from Albaha University, who appraised B-ITAAM with positive reviews and with also some additional valuable remarks. In terms of the feasibility, experts seem to agree that B-ITAAM is feasible for application in real-life cases following the successful instantiation of the method in Albaha University. Nonetheless, some experts pointed out that only specialists would be able to use this method in real-life scenarios due to its comprehensiveness. In terms of the usability of the B-ITAAM, experts demonstrate medium to high levels of satisfaction towards the clarity of the business analysis techniques defined in B-ITAAM and its ability to decompose and recompose complex business-aligned IT services for alignment assessment. However, they argued that the method may not be easy to be implemented in practice.

Although it may appear that B-ITAAM is not easy to be applied in real-life cases as the experts indicated, the method is addressing a very complex business and IT alignment issue that faces IT managers guided by critical strategic concerns to provide facts from multiple perspectives that aim to improve business performance so as to better meet business goals. This may have affected the ease of the method with regards to practical application. Finally, the usefulness of the B-ITAAM is evaluated by the experts, who totally agree that B-ITAAM

serves the purpose of assessing business and IT alignment at the operational level of an organisation. Experts also found the outcomes from the application of the B-ITAAM in Albaha University to be useful and of good quality to the university. However, they argue that other confirming case studies must be carried out first before the generalisability of the method can be determined.

The results from the evaluation establish B-ITAAM as an acceptable solution for alignment assessment at the operational level of organisations. B-ITAAM, in itself, and through its development and application in a case study, have brought contributions to the theories and practices of business and IT alignment. The aim and objectives of this research have been achieved while some limitations have been identified as opportunities for future work, which are highlighted in the next chapter.

Chapter 8
Conclusion and Future Work

This chapter presents concluding remarks that highlight the successful fulfilment of the research objectives. In addition, possible future research directions are proposed based on the implications and limitations of this research. Through Design Science Research, the research aims to design an artefact (i.e. B-ITAAM), as a solution for a holistic business and IT alignment assessment at the operational level of organisations guided by strategic motives. However, due to the complex nature of the research problem, shortcomings in the current form of B-ITAAM are highlighted for future work.

8.1 Concluding Remarks

Achieving mature business and IT alignment at the operational level of an organisation and being able to determine the maturity level of this alignment are two major concerns that face business and IT managers across different organisations. Higher education organisations, for example, have been discussed in the IT alignment literature to have the lowest business and IT alignment maturity level compared with many other public and private sector organisations. The business and IT alignment challenge in this sector has also been observed by the researcher at Albaha University, having worked at the university IT centre for nearly two years. This IT centre has received continuous criticism from students and academic staff for its inability to support related business services that are offered by the university. Being aware of this business and IT alignment problem from the real-world perspective is further supported by the awareness of current theoretical and methodological challenges that face comprehensive business and IT alignment assessment at the operational level of organisations. This broad awareness of the research problem defines the scope of the research and establishes a feasible problem as the focus of the research efforts.

Developing a tool that is capable of assisting the evaluation of business and IT alignment at the operational level of organisations in a systematic manner, considering tangible and intangible factors that influence this alignment, is proposed as a research objective. Recommendations drawn from this systematic business-aligned IT assessment are aimed at enhancing the level of alignment between business and IT. The business and IT domains – as the two key components of an organisation – are under investigation in this research and are both independently studied and studied from an alignment point of view. The social and

technical aspects that influence this alignment at the operational level are specifically highlighted with support from underpinning principles and concepts from Socio-Technical Systems theory, Organisational Semiotics theory and Stakeholders theory.

The investigation of relevant knowledge to address the research problem and design a proper solution is then extended through the early chapters of this research, where the foundations that illustrate how business and IT alignment can be theoretically analysed and how it can be practically assessed are described. With this in mind, principles from Service-Oriented Architecture and Enterprise Architecture are discussed to reflect the service-centric nature of business and IT in an organisational operation. This supports the transformation of business and IT elements at the operational level of an organisation into independent services, enabling comprehensive analysis of their capabilities. Task Technology Fit theory is then discussed, which is adopted for its principles to map business and IT services. Principles from Social Exchange Theory are then described, which are adopted to determine the degree of fit between resultant business-aligned IT mappings. The degree of fit is obtained through analysis of a set of defined tangible and intangible factors that are identified as having influence on the level of alignment between business and IT. The set of principles and concepts that have been studied and critically evaluated through the early chapters of the thesis have supported the development of the Business and IT Alignment Assessment Method (B-ITAAM) as a proposed mechanism for the business and IT alignment assessment (cf. Table 3.5).

To support the development of B-ITAAM from a scientific point of view, the Design Science Research (DSR) paradigm is adopted to guide the research activities; it is suitable due to the problem-solving nature of this research. DSR has not been adopted without an initial consideration of different research paradigms, methodologies, methods and techniques that are relevant to information systems research. Following the adoption of DSR, a mixed methodology approach is adopted to guide the selection of appropriate methods and techniques that facilitate the development and evaluation of the solution. Case study is then adopted as an inquiry method, which is appropriate for applying and evaluating the proposed solution in a real-world context. Multiple data collection techniques, including questionnaires, interviews and content analysis, are then used to collect data from the field and also to support the development and evaluation of the solution.

The B-ITAAM is then presented, which is a methodological solution for the assessment of business and IT alignment at the operational level of organisations. B-ITAAM comprises a set of fourteen business analysis techniques that are grouped into four interrelated stages

working together as a mechanism to address different angles of business and IT alignment analysis and assessment. Table 8.1 illustrates these techniques along with section number indicating where they have been explained in the thesis and the position of each technique in relation to the B-ITAAM. Through its techniques, B-ITAAM enables a comprehensive analysis of business operations and supporting IT resources, while being guided by strategic motives. Its outcomes provide facts that are capable of assisting an organisation with the enhancement of its operational performance towards achieving strategic objectives.

Table 8.1: The fourteen business analysis techniques defined in B-ITAAM

Technique	**Section in thesis**	**Technique's position in B-ITAAM**
KPIs derivation	5.2.1	Stage 1_A
KPIs to business services mapping	5.2.1	
Business context analysis	5.2.2	Stage 1_B
Business service profiling	5.3.1	Stage 2_A
Business norms analysis	5.3.1.1	
Business service strategic value assessment	5.3.1.2	
Business service efficiency analysis	5.3.1.3	
Perceived business service performance analysis	5.3.1.4	
IS service criticality analysis	5.3.1.5	
IT repository development	5.3.2.1	Stage 2_B
IT service profiling	5.3.2.2	
Users' perceptions towards IT application components	5.4.2.1	Stage 3
Technical quality analysis of IT	5.4.2.2	
Financial gains acquired from IT implementation	5.4.2.3	

The B-ITAAM is then successfully applied in Albaha University to determine its viability as an effective business and IT alignment assessment tool. The application of B-ITAAM as a solution to address the business and IT alignment problem at Albaha University produces outcomes that aim to enhance the operational performance of the university and increase its students' levels of satisfaction towards core offered services. Among these outcomes, it is reported to the university that some IT resources are underutilised; other IT resources are also reported to have low technical quality or low perceived value from its users. It is also reported that many students are not satisfied with the performance of a number of core offered business services. These and other outcomes generated through B-ITAAM's techniques illustrate the business and IT alignment challenges that Albaha University faces, which are all shared with the university decision-makers for actions to be taken. A list of

recommendations to enhance the level of alignment between business and IT services at Albaha University is also provided.

Experts from Albaha University have engaged in research activities on two occasions. Firstly, they approved the appropriateness of the solution to be applied at the university during the development stage of the solution. Secondly, they evaluated the solution in terms of its feasibility, usability and usefulness after its application in the university. This is to ensure the relevance of the solution to the university context which represents the problem domain. Based on the evaluation of the solution by the experts, they positively appraised the ability of B-ITAAM to address the alignment challenge at the university and the outcomes of the application that would assist the university for improving its operational performance.

The contributions made by this research are then revealed, which are not limited to the theoretical base of business and IT alignment, but also to its practice through a practical methodological tool that is capable of comprehensively evaluating business and IT alignment at the operational level of organisations and providing recommendations by which the operational performance of an organisation can be enhanced with regards to achieving business goals and objectives. The research limitations are also revealed to provide directions for future work.

8.2 Future Work

Several challenges have emerged throughout the development of this research project. Some are considered to be out of the research scope, while others are acknowledged as limitations. These challenges are collated into a number of recommendations for future work, as follows.

Extend the application of B-ITAAM in other contexts

Extending the application of B-ITAAM in other business contexts and environments is a potential future work. Multiple applications of the B-ITAAM in other higher education institutions from Saudi Arabia or elsewhere would not only reveal more evidence on how the B-ITAAM behaves in this sector but would also reveal more challenging issues that face comprehensive business and IT alignment assessment in this idiosyncratic business environment. The application of B-ITAAM in other public or private service organisations would also strengthen the value of B-ITAAM as a viable tool that can be utilised to assess business and IT alignment at the operational level of organisations. It may also increase awareness of further aspects or angles that should be taken into consideration to efficiently and effectively assess business-aligned IT at the operational landscape of organisations.

Utilise B-ITAAM as a readiness assessment mechanism prior effective participation in Digital Business Ecosystems

It has been predicted that future IT alignment research will focus more on coordinating the IT capabilities of different participants in digital business ecosystems to co-create business values (Coltman et al., 2015). This is due to the rise of digital business strategies and growing participation in innovation ecosystems, both of which are predicted to influence and guide the future of IT alignment research. Although this new direction is beyond the scope of this research due to the lack of literature and research that addressed the intertwining of IT alignment with digital business ecosystems, the focus on evaluating internal organisational competencies through B-ITAAM can help with the evaluation of an organisation's readiness to participate in such digital ecosystems. However, the current form of B-ITAAM may still require further enhancement and incorporation of other factors in order to be analysed with respect to its feasibility and ability to comprehensively assess the digital business competencies of an organisation.

Include IT costing aspects as tangible factors influencing final recommendations to be drawn for IT applications through B-ITAAM

Each IT application is described in this research as consisting of a number of IT application components. This complicates the incorporation of costing aspects as tangible factors that can influence the final recommendation to be made for IT applications. This is because costing aspects of IT applications include purchasing costs, maintenance costs, licensing, etc., cannot be precisely broken down per IT component. This presents a future work opportunity where a mechanism can be developed to provide a rough estimation of IT application components' costs to facilitate more sensible recommendations for each IT application component. This would help to determine whether an IT application component or the whole IT application are costly in terms of supporting related business services, as well as determining if there are other cost-effective IT solutions.

Determine for each IT application component whose perceptions should be considered the most in the B-ITAAM

Users' perceptions of the usability and usefulness of an IT application component to support related business service are considered in this research as an important social factor that influences the value of business and IT alignment. However, a single IT application component can be used by different types of stakeholders, creating a challenge in determining whose perceptions should be considered the most important in the evaluation

analysis. Making a distinction (through percentage), for example, between different users of each IT application component would help to realise whose perceptions should be considered the most important with regards to final recommendations for IT application components. This approach is worth taking if more weight is to be assigned to subjective values to judge the final recommendations for an IT application component. Main users of an IT application component would then have more influence on the derived recommendation for an IT application component compared with secondary users.

Determine in what way an IT application component will be affected if it is associated with other IT application components to support a business service

This research dealt with IT application components to enable customised recommendations for each of these components after going through the business analysis techniques defined in the B-ITAAM. However, the research does not investigate what will happen to other associated IT application components supporting the same business service if, for example, one component is recommended to be removed. This is considered beyond the scope of this research. However, a possible future research opportunity is to establish another level of investigation that assists a more comprehensive approach to observe and deal with more challenging business and IT alignment issues.

Reach wider audience in research and practice through the dissemination and communication of B-ITAAM and its outcomes

The communication of the research and its outcomes is a fundamental aspect in the Design Science Research. Therefore, B-ITAAM, as an artefact that addresses business and IT alignment assessment, is planned to be published in an information systems journal along with the findings of the case study application. The aim is to share the research and its outcomes with experts and practitioners from the field who can provide valuable feedback, guidance and advice to further enhance the capability and performance of the B-ITAAM.

References

Acemoglu, D., Jackson, M. O. 2015. History, expectations, and leadership in the evolution of social norms. *The Review of Economic Studies,* 82**,** 423-456.

Adler, P. A., Adler, P. 1987. *Membership roles in field research*, Sage.

Agar, M. H. 1996. The professional stranger: An informal introduction to ethnography. *Academic Press*, San Diego, CA.

Agarwal, R., Sambamurthy, V. 2002. Principles and models for organizing the IT function. *MIS Quarterly Executive,* 1**,** 1-16.

Agle, B. R., Mitchell, R. K., Sonnenfeld, J. A. 1999. Who matters to Ceos? An investigation of stakeholder attributes and salience, corpate performance, and Ceo values. *Academy of management journal,* 42**,** 507-525.

Aguilar-Saven, R. S. 2004. Business process modelling: Review and framework. *International Journal of production economics,* 90**,** 129-149.

Alamri, M. 2011. Higher education in Saudi Arabia. *Journal of Higher Education Theory and Practice,* 11**,** 88.

Alexander, I. F. 2006. A. Taxonomy. of. Stakeholders: Human. Roles. in. System. Development. *Issues and Trends in Technology and Human Interaction*.

Alves, H., Raposo, M. 2007. Conceptual model of student satisfaction in higher education. *Total Quality Management,* 18**,** 571-588.

Alwadain, A., Korthaus, A., Fielt, E., Rosemann, M. Integrating SOA into an enterprise architecture: a comparative analysis of alternative approaches. Proceedings of the 5th IFIP International Conference on Research and Practical Issues of Enterprise Information Systems (CONFENIS), 2010. Ministry of Education (Brazil).

Armour, F. J., Kaisler, S. H., Liu, S. Y. 1999. A big-picture look at enterprise architectures. *IT professional,* 1**,** 35-42.

Atkinson, M., Deroure, D., Dunlop, A., Fox, G., Henderson, P., Hey, T., Paton, N., Newhouse, S., Parastatidis, S., Trefethen, A. 2005. Web Service Grids: an evolutionary approach. *Concurrency and Computation: Practice and Experience,* 17**,** 377-389.

Avgerou, C., Madon, S. 2004. Framing IS studies: understanding the social context of IS innovation. *The social study of information and communication technology: Innovation, actors, and contexts***,** 162-182.

Avison, D. E., Nandhakumar, J. The discipline of information systems: Let many flowers bloom! Proceedings of the IFIP international working conference on Information system concepts: Towards a consolidation of views, 1995. Chapman & Hall, Ltd., 1-17.

Ayoola, O. L., Mcgovern, E., Mangina, E., Collier, R. 2008. Adaptive e-learning: Harnessing mobile e-learning to enhance the third level academic experience. *Proceedings of ICICTE 2008*.

Baker, L. 2006. Observation: A complex research method. *Library Trends,* 55**,** 171-189.

Barjis, J. 2009. Collaborative, participative and interactive enterprise modeling. *Enterprise information systems.* Springer.

Barr, R. B., Tagg, J. 1995. From teaching to learning—A new paradigm for undergraduate education. *Change: The magazine of higher learning,* 27**,** 12-26.

Baskerville, R. L. 1999. Investigating information systems with action research. *Communications of the AIS,* 2**,** 4.

Bauer, K. 2004. KPIs-The metrics that drive performance management. *Information Management,* 14**,** 63.

Baxter, G., Sommerville, I. 2011. Socio-technical systems: From design methods to systems engineering. *Interacting with Computers,* 23**,** 4-17.

Bei, L.-T., Chiao, Y.-C. 2006. The determinants of customer loyalty: an analysis of intangible factors in three service industries. *International Journal of Commerce and Management,* 16**,** 162-177.

Belter, R., Ludwig, A., Franczyk, B., Spies, T., Eicker, S. Towards information transparency in the context of service management. Service-Oriented Computing and Applications (SOCA), 2010 IEEE International Conference on, 2010. IEEE, 1-8.

Benbasat, I., Goldstein, D. K., Mead, M. 1987. The case research strategy in studies of information systems. *MIS quarterly*, 369-386.
Benbya, H., Mckelvey, B. 2006. Using coevolutionary and complexity theories to improve IS alignment: a multi-level approach. *Journal of Information Technology*, 21, 284-298.
Bennis, W., Nanus, B. 1985. The strategies for taking charge. *Leaders, New York: Harper. Row*.
Bergeron, F., Raymond, L., Rivard, S. 2004. Ideal patterns of strategic alignment and business performance. *Information & management*, 41, 1003-1020.
Bertrand, I., Hughes, P. 2005. Media Research Methods: Audiences, Institutions. Texts, London: Macmillan.
Beynon-Davies, P. 2013. *Business information systems*, Palgrave Macmillan.
Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., Venkatraman, N. 2013. Digital business strategy: toward a next generation of insights. *Mis Quarterly*, 37, 471-482.
Bicchieri, C., Muldoon, R. 2011. Social norms.
Bieberstein, N., Bose, S., Walker, L., Lynch, A. 2005. Impact of service-oriented architecture on enterprise systems, organizational structures, and individuals. *IBM systems journal*, 44, 691-708.
Binyamin, S., Rutter, M., Smith, S. Factors Influencing the Students' Use of Learning Management Systems: A Case Study of King Abdulaziz University. ICEL 2017-Proceedings of the 12th International Conference on e-Learning, 2017. Academic Conferences and publishing limited, 289.
Bisantz, A. M., Burns, C. M. 2008. *Applications of cognitive work analysis*, CRC Press.
Blackboard. 2016. *Blackboard Learning Core* [Online]. Available: http://uki.blackboard.com/solutions/learning-core.aspx [Accessed 21 May 2016].
Blau, P. M. 1964. *Exchange and power in social life*, Transaction Publishers.
Blazey, P., Ashiabor, H., Janu, P. 2008. Stakeholder expectations for generic skills in accounting graduates: Curriculum mapping and implications for change. *Macquarie Law WP 2008*, 13.
Boettcher, J., Cartwright, G. P. 1997. Designing and supporting courses on the web. *Change: The Magazine of Higher Learning*, 29, 10-10.
Boguslauskas, V., Kvedaraviciene, G. 2015. Difficulties in identifying Company's Core Competencies and Core Processes. *Engineering Economics*, 62.
Boonstra, A., Broekhuis, M., Van Offenbeek, M., Wortmann, H. 2011. Strategic alternatives in telecare design: Developing a value-configuration-based alignment framework. *The Journal of Strategic Information Systems*, 20, 198-214.
Bostrom, R. P., Heinen, J. S. 1977. MIS problems and failures: A socio-technical perspective. *MIS Quarterly*, 1, 17-32.
Bradley, R. V., Pratt, R. M., Byrd, T. A., Outlay, C. N., Wynn Jr, D. E. 2012. Enterprise architecture, IT effectiveness and the mediating role of IT alignment in US hospitals. *Information Systems Journal*, 22, 97-127.
Bradley, R. V., Pratt, R. M., Byrd, T. A., Simmons, L. 2011. The role of enterprise architecture in the quest for it value. *MIS Quarterly Executive*, 10, 19-27.
Brahe, S. 2007. BPM on Top of SOA: Experiences from the Financial Industry. *Business process management*. Springer.
Broadbent, M. 1998. *Leveraging the new infrastructure: how market leaders capitalize on information technology*, Harvard Business Press.
Broadbent, M., Weill, P. 1993. Improving business and information strategy alignment: Learning from the banking industry. *IBM systems journal*, 32, 162-179.
Brophy, J. 1987. Educating Teachers about Managing Classrooms and Students. Occasional Paper No. 115.
Brown, A., Johnston, S., Kelly, K. 2002. Using service-oriented architecture and component-based development to build web service applications. *Rational Software Corporation*, 6.
Brown, J. S., Duguid, P. 2001. Knowledge and organization: A social-practice perspective. *Organization science*, 12, 198-213.
Brown, R. 2015. The marketisation of higher education: Issues and ironies. *New Vistas*, 1, 4-9.
Bryman, A., Cramer, D. 1994. *Quantitative data analysis for social scientists (rev*, Taylor & Frances/Routledge.
Brynjolfsson, E. 1993. The productivity paradox of information technology. *Communications of the ACM*, 36, 66-77.

Brynjolfsson, E., Hitt, L. M. 2000. Beyond computation: Information technology, organizational transformation and business performance. *The Journal of Economic Perspectives*, 23-48.
Burrows, J. 1999. Going beyond labels: A framework for profiling institutional stakeholders. *Contemporary Education*, 70, 5.
Campbell, A., Norton, L. 2007. *Learning, teaching and assessing in higher education: Developing reflective practice*, Learning Matters.
Campbell, A., Tawadey, K. 2016. *Mission and business philosophy*, Elsevier.
Campbell, A., Yeung, S. 1991. Brief case: mission, vision and strategic intent. *Long range planning*, 24, 145-147.
Carr, A. S., Pearson, J. N. 1999. Strategically managed buyer–supplier relationships and performance outcomes. *Journal of operations management*, 17, 497-519.
Chan, Y. E. 1992. Business strategy, information systems strategy, and strategic fit: Measurement and performance impacts. PhD. Dissertation, Queens University.
Chan, Y. E. 2002. Why haven't we mastered alignment? The importance of the informal organization structure. *MIS Quarterly executive*, 1, 97-112.
Chan, Y. E., Reich, B. H. 2007. IT alignment: what have we learned? *Journal of Information technology*, 22, 297-315.
Charmaz, K. 2006. Constructing grounded theory: A practical guide through qualitative analysis, SAGE, London.
Checkland, P. 1999. Soft systems methodology: a 30-year retrospective. John Wiley, UK.
Checkland, P., Poulter, J. 2006. *Learning for action: a short definitive account of soft systems methodology and its use for practitioner, teachers, and students*, Wiley Chichester.
Chen, D. Q., Mocker, M., Preston, D. S., Teubner, A. 2010. Information systems strategy: reconceptualization, measurement, and implications. *MIS quarterly*, 34, 233-259.
Chen, H.-M. Towards service engineering: service orientation and business-IT alignment. Hawaii International Conference on System Sciences, Proceedings of the 41st Annual, 2008. IEEE, 114-114.
Chen, H.-M., Kazman, R., Garg, A. 2005a. BITAM: An engineering-principled method for managing misalignments between business and IT architectures. *Science of Computer Programming*, 57, 5-26.
Chen, H., Kazman, R., Garg, A. 2005b. Managing misalignments between business and IT architectures: a BITAM approach. *Journal of Science of Computer Programming*, 57, 5-26.
Chen, L. 2010. Business–IT alignment maturity of companies in China. *Information & Management*, 47, 9-16.
Chen, R.-S., Sun, C.-M., Helms, M. M., Jih, W.-J. 2008. Aligning information technology and business strategy with a dynamic capabilities perspective: A longitudinal study of a Taiwanese Semiconductor Company. *International Journal of Information Management*, 28, 366-378.
Cherbakov, L., Galambos, G., Harishankar, R., Kalyana, S., Rackham, G. 2005. Impact of service orientation at the business level. *IBM Systems Journal*, 44, 653-668.
Cherns, A. 1976. The Principles of Sociotechnical Design1. *Human relations*, 29, 783-792.
Chesbrough, H., Spohrer, J. 2006. A research manifesto for services science. *Communications of the ACM*, 49, 35-40.
Choi, S. W., Kim, S. D. A quality model for evaluating reusability of services in soa. E-Commerce Technology and the Fifth IEEE Conference on Enterprise Computing, E-Commerce and E-Services, 2008 10th IEEE Conference on, 2008. IEEE, 293-298.
Ciborra, C. U. 1997. De profundis? Deconstructing the concept of strategic alignment. *Scandinavian journal of information systems*, 9, 2.
Clarke, R. 2001. Studies in Organisational Semiotics: an introduction. *Australasian Journal of Information Systems*, 8.
Clarke, R. J., Nilsson, A. G. 2008. Business services as communication patterns: A work practice approach for analyzing service encounters. *IBM Systems Journal*, 47, 129-141.
Clegg, C. W. 2000. Sociotechnical principles for system design. *Applied ergonomics*, 31, 463-477.
Coertze, J., Von Solms, R. The Board and CIO: The IT Alignment Challenge. System Sciences (HICSS), 2014 47th Hawaii International Conference on, 2014. IEEE, 4426-4435.
Colbran, S., Al-Ghreimil, N. 2013. The role of information technology in supporting quality teaching and learning. *Higher Education in Saudi Arabia*. Springer.

Coltman, T. R., Tallon, P. P., Sharma, R., Queiroz, M. 2015. Strategic IT alignment: twenty-five years on. *Journal of Information Technology*.
Cook, K. S., Whitmeyer, J. M. 1992. Two approaches to social structure: Exchange theory and network analysis. *Annual review of Sociology***,** 109-127.
Corbin, J., Strauss, A. 2014. *Basics of qualitative research: Techniques and procedures for developing grounded theory*, Sage publications.
Costin, H. I. 2001. *An empirical study of strategy-structure-performance relationships of graduate business schools and AACSB accredited MBA programs.* Boston University.
Cragg, P., King, M., Hussin, H. 2002. IT alignment and firm performance in small manufacturing firms. *The Journal of Strategic Information Systems,* 11**,** 109-132.
Crawford, C. H., Bate, G. P., Cherbakov, L., Holley, K., Tsocanos, C. 2005. Toward an on demand service-oriented architecture. *IBM Systems Journal,* 44**,** 81-107.
Crawford, S. E., Ostrom, E. 1995. A grammar of institutions. *American Political Science Review,* 89**,** 582-600.
Cropanzano, R., Mitchell, M. S. 2005. Social exchange theory: An interdisciplinary review. *Journal of Management,* 31**,** 874-900.
Cumps, B., Martens, D., De Backer, M., Haesen, R., Viaene, S., Dedene, G., Baesens, B., Snoeck, M. 2009. Inferring comprehensible business/ICT alignment rules. *Information & Management,* 46**,** 116-124.
Danesi, M., Perron, P. 1999. *Analyzing cultures: An introduction and handbook*, Indiana University Press.
Davenport, T. H., Short, J. E. 1990. The new industrial engineering: information technology and business process redesign. *Sloan Management Review*, Vol. 31 No. 4, pp. 11-27.
David, F., Abreu, R. Information technology in education: Recent developments in higher education. Information Systems and Technologies (CISTI), 2014 9th Iberian Conference on, 2014. IEEE, 1-6.
Davis, E. The effects of technological and organizational innovations on business value in the context of a new product or service deployment. Systems, Applications and Technology Conference (LISAT), 2017 IEEE Long Island, 2017. IEEE, 1-6.
Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly***,** 319-340.
De Haes, S., Van Grembergen, W. 2015. Business/IT Alignment. *Enterprise Governance of Information Technology*. Springer.
De Hoog, R. 1998. Methodologies for building knowledge based systems: Achievements and prospects. *The Handbook of Applied Expert Systems,* 1.
Delone, W. H., Mclean, E. R. 2004. Measuring e-commerce success: Applying the DeLone & McLean information systems success model. *International Journal of Electronic Commerce,* 9**,** 31-47.
Deniz, M. ROLE OF INFORMATION TECHNOLOGY AT UNIVERSITY SUCCESS. SGEM2014 Conference on Psychology and Psychiatry, Sociology and Healthcare, Education, 2014. STEF92 Technology, 777-784 pp.
Denzin, N. K., Lincoln, Y. S. 2011. *The SAGE handbook of qualitative research*, Sage.
Dimakis, N., Soldatos, J., Polymenakos, L., Schenk, M., Pfirrmann, U., Burkle, A. Perceptive middleware and intelligent agents enhancing service autonomy in smart spaces. Proceedings of the IEEE/WIC/ACM international conference on Intelligent Agent Technology, 2006. IEEE Computer Society, 276-283.
Dishaw, M. T., Strong, D. M. 1999. Extending the technology acceptance model with task–technology fit constructs. *Information & management,* 36**,** 9-21.
Doumi, K., Baina, S., Baina, K. 2013. Strategic Business and IT Alignment: Representation and Evaluation. *Journal of Theoretical and Applied Information Technology,* 47**,** 41-52.
Drnevich, P. L., Croson, D. C. 2013. Information technology and business-level strategy: toward an integrated theoretical perspective. *Mis Quarterly,* 37**,** 483-509.
Dufour, R., Dufour, R. 2012. *Revisiting Professional Learning Communities at WorkTM: New Insights for Improving Schools*, Solution Tree Press.
Easterby-Smith, M., Thorpe, R., Jackson, P. R. 2012. *Management research*, Sage.
El Houry, M., Dogan, B. 2015. Business and IT Alignment: The Factors Affecting Alignment in Small to Medium Sized Businesses. *Department of Informatics*. Lund University.

Emerson, R. M. 1976. Social exchange theory. *Annual review of sociology*, 335-362.
Erl, T. 2008. *Soa: principles of service design*, Prentice Hall Upper Saddle River.
Evans, A. 2004. *A framework for creating fusion in the business-IT interface*. University of Pretoria.
Faheem, K., Rafique, K. 2015. Securing 4G/5G wireless networks. *Computer Fraud & Security*, 2015, 8-12.
Fathee, M. M., Redd, R., Gorgas, D., Modarres, B. The effects of complexity on business processes reengineering: values and limitations of modeling and simulation technologies. Simulation Conference Proceedings, 1998. Winter, 1998. IEEE, 1339-1345.
Fehr, E., Gächter, S. 2000. Fairness and retaliation: The economics of reciprocity. *The journal of economic perspectives*, 159-181.
Feuerlicht, G. 2007. Understanding Service Reusability.
Finlay, P. N. 1989. *Introducing decision support systems*, NCC Blackwell.
Fischer, C., Winter, R., Wortmann, F. 2010. Design theory. *Business & Information Systems Engineering*, 2, 387-390.
Flaxer, D., Nigam, A. Realizing business components, business operations and business services. E-Commerce Technology for Dynamic E-Business, 2004. IEEE International Conference on, 2004. IEEE, 328-332.
Foddy, W. 1994. *Constructing questions for interviews and questionnaires: theory and practice in social research*, Cambridge university press.
Forkosh-Baruch, A., Hershkovitz, A. 2012. A case study of Israeli higher-education institutes sharing scholarly information with the community via social networks. *The Internet and Higher Education*, 15, 58-68.
Franz, R. S. 1998. Whatever you do, don't Treat your Students Like Customers! *Journal of Management Education*, 22, 63.
Fred, D., Forest, D. 2015. *Strategic Management Concepts and Cases*, England.
Freeman, R. E. 2010. *Strategic management: A stakeholder approach*, Cambridge University Press.
Freeman, R. E., Harrison, J. S., Wicks, A. C. 2007. *Managing for stakeholders: Survival, reputation, and success*, Yale University Press.
Friedman, A. L., Miles, S. 2006. *Stakeholders: Theory and practice*, Oxford University Press.
Galliers, R. D. Choosing appropriate information systems research approaches: a revised taxonomy. In Proceedings of the IFIP TC8 WG8. 2, 1990. Citeseer.
Gammelgård, M., Simonsson, M., Lindström, Å. 2007. An IT management assessment framework: evaluating enterprise architecture scenarios. *Information Systems and E-Business Management*, 5, 415-435.
Gartner. 2008. *Gartner Says Worldwide IT Spending On Pace to Surpass $3.4 Trillion in 2008* [Online]. STAMFORD, Conn. Available: http://www.gartner.com/newsroom/id/742913 [Accessed 28 March 2015].
Gartner. 2010. *Gartner Says Worldwide IT Spending to Grow 5.3 Percent in 2010* [Online]. STAMFORD, Conn. Available: http://www.gartner.com/newsroom/id/1339013 [Accessed 28 March 2015].
Gazendam, H. W. 2004. Organizational Semiotics: a state of the art report. *Semiotix*, 1, 1-5.
Gerow, J. E., Thatcher, J. B., Grover, V. 2014. Six Types of IT-Business Strategic Alignment: An investigation of the constructs and their measurement. *European Journal of Information Systems*.
Giachetti, R. E. 2016. *Design of enterprise systems: Theory, architecture, and methods*, CRC Press.
Gibson, S. G., Harris, M. L., Colaric, S. M. 2008. Technology acceptance in an academic context: Faculty acceptance of online education. *Journal of Education for Business*, 83, 355-359.
Gill, N. S. 2006. Importance of software component characterization for better software reusability. *ACM SIGSOFT Software Engineering Notes*, 31, 1-3.
Glaser, B., Strauss, A. 1967. The Discovery of Grounded Theory. *London: Weidenfeld and Nicholson*.
Glaser, B. G., Strauss, A. L. 2009. *The discovery of grounded theory: Strategies for qualitative research*, Transaction Publishers.
Golemati, M., Katifori, A., Vassilakis, C., Lepouras, G., Halatsis, C. Creating an ontology for the user profile: Method and applications. Proceedings of the first RCIS conference, 2007. 407-412.

Goodhue, D. L. 2006. Task-technology fit. *Human-computer interaction and management information systems: applications. New York: Sharpe***,** 184-204.
Goodhue, D. L., Thompson, R. L. 1995. Task-technology fit and individual performance. *MIS quarterly***,** 213-236.
Gottschalk, P., Solli-Sæther, H. 2005. Critical success factors from IT outsourcing theories: an empirical study. *Industrial Management & Data Systems,* 105**,** 685-702.
Gregor, S., Hevner, A. R. 2013. Positioning and presenting design science research for maximum impact. *MIS quarterly,* 37**,** 337-356.
Griffith, D. A., Harvey, M. G., Lusch, R. F. 2006. Social exchange in supply chain relationships: The resulting benefits of procedural and distributive justice. *Journal of operations management,* 24**,** 85-98.
Guba, E. G. 1990. *The paradigm dialog,* Sage Publications.
Guba, E. G., Lincoln, Y. S. 1989. *Fourth generation evaluation*, Sage.
Guijarro, L. 2007. Interoperability frameworks and enterprise architectures in e-government initiatives in Europe and the United States. *Government Information Quarterly,* 24**,** 89-101.
Gutierrez, A., Serrano, A. 2008. Assessing strategic, tactical and operational alignment factors for SMEs: alignment across the organisation's value chain. *International Journal of Value Chain Management,* 2**,** 33-56.
Hafeez, K., Zhang, Y., Malak, N. 2002. Core competence for sustainable competitive advantage: A structured methodology for identifying core competence. *Engineering Management, IEEE Transactions on,* 49**,** 28-35.
Haki, M. K., Forte, M. W. Proposal of a service oriented architecture governance model to serve as a practical framework for business-IT Alignment. New Trends in Information Science and Service Science (NISS), 2010 4th International Conference on, 2010. IEEE, 410-417.
Hale, A. J., Cragg, P. B. Measuring strategic alignment in small firms. Information Systems Conference of New Zealand, 1996. Proceedings, 1996. IEEE, 127-135.
Hall, E. T. 1959. The Silent Language. *New York.*
Hallowell, R. 1996. The relationships of customer satisfaction, customer loyalty, and profitability: an empirical study. *International journal of service industry management,* 7**,** 27-42.
Hamidou Dia, R. H., Maureen Clifford 2010. Application Portfolio Rationalization: How IT Standardization Fuels Growth. Available: http://www.oracle.com/technetwork/topics/entarch/articles/oracle-ea-app-portfolio-167297.pdf [Accessed 01 May 2015].
Hammer, M., Champy, J. 2009. *Reengineering the Corporation: Manifesto for Business Revolution, A*, Zondervan.
Hariharan, C. 2009. *Enterprise Architecture & Service Oriented Architecture.* The Pennsylvania State University.
Harteloh, P. P. 2003. Quality systems in health care: a sociotechnical approach. *Health Policy,* 64**,** 391-398.
Hartwick, J., Barki, H. 1994. Explaining the role of user participation in information system use. *Management science,* 40**,** 440-465.
Havey, M. 2005. *Essential business process modeling*, O'Reilly, Beijing, Cambridge.
Hazelkorn, E. 2011. Rankings and the Reshaping of Higher Education: The Battle for World-Class Excellence. *Palgrave Macmillan*.
Hazelkorn, E. 2015. *Rankings and the reshaping of higher education: The battle for world-class excellence*, Palgrave Macmillan.
Heidari, F., Loucopoulos, P., Kedad, Z. 2011. A quality-oriented business process meta-model. *Enterprise and Organizational Modeling and Simulation***,** 85-99.
Hénard, F., Roseveare, D. 2012. Fostering quality teaching in higher education: Policies and Practices. *An IMHE Guide for Higher Education Institutions*.
Henderson, J. C., Venkatraman, N. 1992. *Strategic alignment: a model for organizational transformation through information technology*, Oxford University Press, New York.
Henderson, J. C., Venkatraman, N. 1993. Strategic alignment: Leveraging information technology for transforming organizations. *IBM systems journal,* 32**,** 4-16.
Hevner, A., Chatterjee, S. 2010. *Design science research in information systems*, Springer.
Hevner, A. R., March, S. T., Park, J., Ram, S. 2004. Design science in information systems research. *MIS quarterly,* 28**,** 75-105.

Hinkelmann, K., Gerber, A., Karagiannis, D., Thoenssen, B., Van Der Merwe, A., Woitsch, R. 2016. A new paradigm for the continuous alignment of business and IT: combining enterprise architecture modelling and enterprise ontology. *Computers in Industry,* 79**,** 77-86.

Hirschheim, R., Klein, H. K. 1994. Realizing emancipatory principles in information systems development: the case for ETHICS. *MIS quarterly***,** 83-109.

Hirschheim, R., Klein, H. K., Lyytinen, K. 1995. *Information systems development and data modeling: conceptual and philosophical foundations*, Cambridge University Press.

Hitt, L. M., Brynjolfsson, E. 1996. Productivity, business profitability, and consumer surplus: three different measures of information technology value. *MIS quarterly***,** 121-142.

Hobeanu, L. V. 2010. The restructuring of the Romanian Higher Education System. *Journal of Research in Educational Sciences,* 1**,** 115-124.

Hoffman, J. J., Cullen, J. B., Carter, N. M., Hofacker, C. F. 1992. Alternative methods for measuring organization fit: technology, structure, and performance. *Journal of Management,* 18**,** 45-57.

Hofstede, G. H., Hofstede, G. 2001. *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*, Sage.

Hogan, S. 1997. Positioning a Brand in the Marketplace. *Viewpoit. Summer*.

Horn, P. 2005. The new discipline of services science: It'sa melding of technology with an understanding of business processes and organization–and it's crucial to the economy's next wave. *Business Week,* 21.

Huang, H.-C., Cheng, T., Huang, W.-F., Teng, C.-I. 2018. Impact of online gamers' personality traits on interdependence, network convergence, and continuance intention: Perspective of social exchange theory. *International Journal of Information Management,* 38**,** 232-242.

Huang, Y.-H., Lee, J., Mcfadden, A. C., Murphy, L. A., Robertson, M. M., Cheung, J. H., Zohar, D. 2016. Beyond safety outcomes: An investigation of the impact of safety climate on job satisfaction, employee engagement and turnover using social exchange theory as the theoretical framework. *Applied ergonomics,* 55**,** 248-257.

Hughes, J. A., Randall, D., Shapiro, D. Faltering from ethnography to design. Proceedings of the 1992 ACM conference on Computer-supported cooperative work, 1992. ACM, 115-122.

Huisman, J. 2007. Images and words: How do UK universities present themselves on the internet? *Branding in Higher Education. Exploring an Emerging Phenomenon***,** 14-35.

Hwang, H.-G., Yeh, R., Chen, H.-G., Jiang, J. J., Klein, G. 2011. IT investment strategy and IT infrastructure services. *Review of Business Information Systems (RBIS),* 6**,** 55-64.

Iso-9126 1991. Information Technology-Software Product Evaluation. *Quality Characteristics and Guidelines for their use***,** 12-15.

Jambari, D. I. 2014. The Significance of Intangible Elements in Measuring the Holistic Effectiveness of Business and IT Alignment. *Journal of Convergence Information Technology,* 9**,** 18.

Jan, A. U., Contreras, V. 2011. Technology acceptance model for the use of information technology in universities. *Computers in Human Behavior,* 27**,** 845-851.

Jawahar, I., Mclaughlin, G. L. 2001. Toward a descriptive stakeholder theory: An organizational life cycle approach. *Academy of management review,* 26**,** 397-414.

Jiang, J. J., Klein, G., Carr, C. L. 2002. Measuring information system service quality: SERVQUAL from the other side. *MIS quarterly***,** 145-166.

Johannessen, J.-A., Olaisen, J., Olsen, B. 2001. Mismanagement of tacit knowledge: the importance of tacit knowledge, the danger of information technology, and what to do about it. *International journal of information management,* 21**,** 3-20.

John, S. P. 2015. The integration of information technology in higher education: A study of faculty's attitude towards IT adoption in the teaching process. *Contaduría y Administración,* 60**,** 230-252.

Johnson, B., Turner, L. A. 2003. Data collection strategies in mixed methods research. *Handbook of mixed methods in social and behavioral research***,** 297-319.

Johnson, D. W. 1994. *Cooperative learning in the classroom*, ERIC.

Johnston, D. A., Mccutcheon, D. M., Stuart, F. I., Kerwood, H. 2004. Effects of supplier trust on performance of cooperative supplier relationships. *Journal of operations Management,* 22**,** 23-38.

Johnston, R. 1995. The zone of tolerance: exploring the relationship between service transactions and satisfaction with the overall service. *International Journal of Service Industry Management,* 6**,** 46-61.

Jongbloed, B., Enders, J., Salerno, C. 2008. Higher education and its communities: Interconnections, interdependencies and a research agenda. *Higher Education,* 56**,** 303-324.
Joshi, M. P., Kathuria, R., Porth, S. J. 2003. Alignment of strategic priorities and performance: an integration of operations and strategic management perspectives. *Journal of Operations Management,* 21**,** 353-369.
Jurisch, M. C., Cuno, J., Palka, W., Wolf, P., Krcmar, H. An integrative model of IT-enabled business process change: Causal structures in theory, research and practice. System Science (HICSS), 2012 45th Hawaii International Conference on, 2012. IEEE, 4297-4306.
Kaplan, B., Maxwell, J. A. 2005. Qualitative research methods for evaluating computer information systems. *Evaluating the organizational impact of healthcare information systems.* Springer.
Kappelman, L., Mclean, E., Johnson, V., Gerhart, N. 2014. The 2014 SIM IT Key Issues and Trends Study. *MIS Quarterly Executive***,** 237-263.
Kappelman, L. A., Mcleon, E., Luftman, J., Johnson, V. 2013. Key issues of IT organizations and their leadership: The 2013 SIM IT trends study. *MIS Quarterly Executive***,** 227-240.
Karpovsky, A., Galliers, R. D. 2015. Aligning in practice: from current cases to a new agenda. *Journal of Information Technology,* 30**,** 136-160.
Kearns, G. S., Lederer, A. L. 2000. The effect of strategic alignment on the use of IS-based resources for competitive advantage. *The Journal of Strategic Information Systems,* 9**,** 265-293.
Kearns, G. S., Lederer, A. L. 2003. A resource-based view of strategic IT alignment: how knowledge sharing creates competitive advantage. *Decision Sciences,* 34**,** 1-29.
Kettinger, W. J., Teng, J. T., Guha, S. 1997. Business process change: a study of methodologies, techniques, and tools. *MIS quarterly***,** 55-80.
Khoshnevis, S., Aliee, F. S., Jamshidi, P. Model driven approach to service oriented enterprise architecture. Services Computing Conference, 2009. APSCC 2009. IEEE Asia-Pacific, 2009. IEEE, 279-286.
Kohlborn, T., Korthaus, A., Chan, T., Rosemann, M. 2009. Identification and analysis of business and software services—a consolidated approach. *IEEE Transactions on Services Computing,* 2**,** 50-64.
Kohli, R., Grover, V. 2008. Business Value of IT: An Essay on Expanding Research Directions to Keep up with the Times. *Journal of the Association for Information Systems,* 9**,** 23-39.
Kothari, C. 2004. *Research methodology: Methods and techniques*, New Age International.
Kuhn, T. S. 2012. *The structure of scientific revolutions*, University of Chicago press.
Lam, T., Cho, V., Qu, H. 2007. A study of hotel employee behavioral intentions towards adoption of information technology. *International Journal of Hospitality Management,* 26**,** 49-65.
Lam, Y., Pang, S. 2003. The relative effects of environmental, internal and contextual factors on organizational learning: the case of Hong Kong schools under reforms. *The Learning Organization: An International Journal,* 10**,** 83-97.
Lapalme, J., Gerber, A., Van Der Merwe, A., Zachman, J., De Vries, M., Hinkelmann, K. 2016. Exploring the future of enterprise architecture: A Zachman perspective. *Computers in Industry,* 79**,** 103-113.
Larson, R. C. 2008. Service science: At the intersection of management, social, and engineering sciences. *IBM Systems Journal,* 47**,** 41-51.
Lawler, E. J., Thye, S. R. 1999. Bringing emotions into social exchange theory. *Annual review of sociology***,** 217-244.
Lazinica, A., Calafate, C. 2009. Technology Education and Development. *InTech*.
Leahey, E. 2007. Convergence and confidentiality? Limits to the implementation of mixed methodology. *Social Science Research,* 36**,** 149-158.
Lederer, A. L., Mendelow, A. L. 1986. Issues in information systems planning. *Information & Management,* 10**,** 245-254.
Lederer, A. L., Mendelow, A. L. 1989. Coordination of information systems plans with business plans. *Journal of Management Information Systems***,** 5-19.
Lee, D., Mithas, S. 2014. IT Investments, Alignment and Firm Performance: Evidence from an Emerging Economy. *Proceeding of ICIS2014,* 29.
Lee, J. D., Kirlik, A. 2013. *The Oxford handbook of cognitive engineering*, Oxford University Press.
Leedy, P. D., Ormrod, J. E. 2005. Practical research. *Planning and design,* 8.
Leimeister, J. M., Böhm, M., Yetton, P. 2012. Managing IT in a business unit divestiture. *a Business Unit Divestiture (August 21, 2014). Leimeister, JM; Böhm, M. & Yetton, P***,** 37-48.

Lincoln, Y. S., Guba, E. G. 1985. *Naturalistic inquiry*, Sage.
Liu, H., Ke, W., Wei, K. K., Hua, Z. 2013. The impact of IT capabilities on firm performance: The mediating roles of absorptive capacity and supply chain agility. *Decision Support Systems,* 54**,** 1452-1462.
Liu, K. 2000. *Semiotics in information systems engineering*, Cambridge University Press.
Liu, K. 2001. *Information, organisation and technology: Studies in organisational semiotics*, Springer Science & Business Media.
Liu, K., Li, W. 2014. *Organisational Semiotics for Business Informatics*, Routledge.
Liu, K., Sun, L., Barjis, J., Dietz, J. L. 2003. Modelling dynamic behaviour of business organisations—extension of DEMO from a semiotic perspective. *Knowledge-Based Systems,* 16**,** 101-111.
Liu, K., Sun, L., Jambari, D., Michell, V., Chong, S. A design of business-technology alignment consulting framework. Advanced Information Systems Engineering, 2011. Springer, 422-435.
Liu, K., Sun, L., Tan, S. 2006. Modelling complex systems for project planning: a semiotics motivated method. *International Journal of General Systems,* 35**,** 313-327.
Lohrmann, M., Reichert, M. 2013. Understanding business process quality. *Business Process Management***,** 41-73.
Lu, H.-P., Yang, Y.-W. 2014. Toward an understanding of the behavioral intention to use a social networking site: An extension of task-technology fit to social-technology fit. *Computers in Human Behavior,* 34**,** 323-332.
Luftman, J. 1996. *Competing in the information age: strategic alignment in practice*, Oxford University Press.
Luftman, J., Ben-Zvi, T. 2010. Key issues for IT executives 2009: Difficult economy's impact on IT. *MIS Quarterly Executive,* 9**,** 203-213.
Luftman, J., Ben-Zvi, T. 2011. Key issues for IT executives 2011: cautious optimism in uncertain economic times. *MIS Quarterly Executive,* 10**,** 203-212.
Luftman, J., Brier, T. 1999. Achieving and sustaining business-IT alignment. *California management review,* 42**,** 109-122.
Luftman, J., Kempaiah, R. 2007. An update on business-IT alignment:"A line" has been drawn. *MIS Quarterly Executive,* 6**,** 165-177.
Luftman, J., Kempaiah, R., Rigoni, E. H. 2009. Key issues for IT executives 2008. *MIS Quarterly Executive,* 8**,** 151-159.
Luftman, J., Lyytinen, K., Ben Zvi, T. 2017. Enhancing the measurement of information technology (IT) business alignment and its influence on company performance. *Journal of Information Technology,* 32**,** 26-46.
Luftman, J., Papp, R., Brier, T. 1999. Enablers and inhibitors of business-IT alignment. *Communications of the AIS,* 1**,** 1.
Luftman, J. N., Lewis, P. R., Oldach, S. H. 1993. Transforming the enterprise: The alignment of business and information technology strategies. *IBM systems journal,* 32**,** 198-221.
Luthria, H., Rabhi, F. 2009. Service oriented computing in practice: an agenda for research into the factors influencing the organizational adoption of service oriented architectures. *Journal of theoretical and applied electronic commerce research,* 4**,** 39-56.
Macfarlane, B., Lomas, L. 1999. Stakeholder conceptions of quality in single company management education. *Quality Assurance in Education,* 7**,** 77-84.
Maes, R., Rijsenbrij, D., Truijens, O., Goedvolk, H. 2000. *Redefining business: IT alignment through a unified framework*, Universiteit van Amsterdam, Department of Accountancy & Information Management.
Maij, E., Toussaint, P. J., Kalshoven, M., Poerschke, M., Zwetsloot-Schonk, J. H. 2002. Use cases and DEMO: aligning functional features of ICT-infrastructure to business processes. *International journal of medical informatics,* 65**,** 179-191.
Mainardes, E. W., Alves, H., Raposo, M. 2010. An exploratory research on the stakeholders of a university. *Journal of Management and Strategy,* 1**,** p76.
Mainardes, E. W., Alves, H. M. B., Raposo, M. L. B. 2013. Identifying stakeholders in a portuguese university: a case study. *Revista de educación***,** 429-457.
March, S. T., Smith, G. F. 1995. Design and natural science research on information technology. *Decision support systems,* 15**,** 251-266.

Marr, B. 2010. What are Key Performance Questions. *Management Case Study. The Advanced Performance Insitutute*.
Martin, W. 1999. New directions in education for LIS: knowledge management programs at RMIT. *Journal of Education for Library and Information Science***,** 142-150.
Martinsons, M., Davison, R., Tse, D. 1999. The balanced scorecard: a foundation for the strategic management of information systems. *Decision support systems,* 25**,** 71-88.
Mateski, M., Trevino, C. M., Veitch, C. K., Michalski, J., Harris, J. M., Maruoka, S., Frye, J. 2012. Cyber threat metrics. *Sandia National Laboratories*.
Matthes, D. 2011. *Enterprise Architecture Frameworks Kompendium: Über 50 Rahmenwerke für das IT-Management*, Springer-Verlag.
Maykut, P. S., Morehouse, R. E. 1994. *Beginning qualitative research: A philosophic and practical guide*, Psychology Press.
Mcgloin, C., Mcgloin, R. 2010. Performance management system. Google Patents.
Mcloughlin, I., Harris, M. 1997. *Innovation, organizational change and technology*, Cengage Learning Business Press.
Mcniff, J., Whitehead, J. 2009. *You and your action research project*, Routledge.
Melão, N., Pidd, M. 2000. A conceptual framework for understanding business processes and business process modelling. *Information systems journal,* 10**,** 105-129.
Melville, N., Kraemer, K., Gurbaxani, V. 2004. Review: Information technology and organizational performance: An integrative model of IT business value. *MIS quarterly,* 28**,** 283-322.
Miles, R. E., Snow, C. C., Meyer, A. D., Coleman, H. J. 1978. Organizational strategy, structure, and process. *Academy of management review,* 3**,** 546-562.
Mitchell, R. K., Agle, B. R., Wood, D. J. 1997. Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Academy of management review,* 22**,** 853-886.
Mitra, S., Sambamurthy, V., Westerman, G. 2011. Measuring IT performance and communicating value. *MIS Quarterly Executive,* 10**,** 47-59.
Mohanty, H., Ghosh, R. K., Patnaik, S. A hybrid approach to model workflow in business process. Proceedings of Sixth International Conferences on Information Technology, 2003. 91-96.
Molm, L. D., Cook, K. S. 1995. Social exchange and exchange networks. *Sociological perspectives on social psychology,* 2**,** 209-235.
Mom, T. J., Van Den Bosch, F. A., Volberda, H. W. 2007. Investigating Managers' Exploration and Exploitation Activities: The Influence of Top-Down, Bottom-Up, and Horizontal Knowledge Inflows*. *Journal of Management Studies,* 44**,** 910-931.
Moore, G. C., Benbasat, I. 1991. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research,* 2**,** 192-222.
Mullins, L. J. 2007. *Management and organisational behaviour*, Pearson education.
Myers, M. D., Avison, D. 1997. Qualitative research in information systems. *Management Information Systems Quarterly,* 21**,** 241-242.
Naikar, N., Moylan, A., Pearce, B. 2006. Analysing activity in complex systems with cognitive work analysis: concepts, guidelines and case study for control task analysis. *Theoretical Issues in Ergonomics Science,* 7**,** 371-394.
Navalta, S. L., Mendoza, M. B. 2013. Don Mariano Marcos Memorial State University Integrated Management Information System (DIMIS)
Nicholls, G. 2002. *Developing teaching and learning in higher education*, Psychology Press.
Nicolescu, L. 2009. Applying marketing to higher education: Scope and limits. *Management & Marketing,* 4.
Nishimura, J., Okamuro, H. 2008. Has the industrial cluster project improved the R&D efficiency of industry-university partnership in Japan? : Center for Research on Contemporary Economic Systems, Graduate School of Economics, Hitotsubashi University.
Nordin, N., Kasbon, H. 2013. A Study on Leadership Behaviour and Organizational Learning in Higher Learning Institutions. *Gse journal of education,* 134.
O'reilly, C. A., Chatman, J., Caldwell, D. F. 1991. People and organizational culture: A profile comparison approach to assessing person-organization fit. *Academy of management journal,* 34**,** 487-516.
Oh, W., Pinsonneault, A. 2007. On the assessment of the strategic value of information technologies: conceptual and analytical approaches. *MIS quarterly***,** 239-265.

Olivier, M. S. 2009. *Information technology research: a practical guide for computer science and informatics*, Van Schaik.
Oppenheim, A. N. 2000. *Questionnaire design, interviewing and attitude measurement*, Bloomsbury Publishing.
Orlikowski, W. J. 1993. CASE tools as organizational change: Investigating incremental and radical changes in systems development. *MIS quarterly***,** 309-340.
Orlikowski, W. J., Baroudi, J. J. 1991. Studying information technology in organizations: Research approaches and assumptions. *Information systems research,* 2**,** 1-28.
Ousmanou, K. 2007. *A Method for the Articulation of Users' Requirements for Personalised Information Provision.* University of Reading.
Owlia, M. S., Aspinwall, E. M. 1996. A framework for the dimensions of quality in higher education. *Quality Assurance in Education,* 4**,** 12-20.
Palmer, J. W., Markus, M. L. 2000. The performance impacts of quick response and strategic alignment in specialty retailing. *Information Systems Research,* 11**,** 241-259.
Palmius, J. 2007. Criteria for measuring and comparing information systems. *Proceedings of the 30th information systems seminar in scandinvia (IRIS-30).*
Paloviita, A., Luoma-Aho, V. 2010. Recognizing definitive stakeholders in corporate environmental management. *Management Research Review,* 33**,** 306-316.
Papazoglou, M. P. Service-oriented computing: Concepts, characteristics and directions. Web Information Systems Engineering, 2003. WISE 2003. Proceedings of the Fourth International Conference on, 2003. IEEE, 3-12.
Papazoglou, M. P., Traverso, P., Dustdar, S., Leymann, F. 2008. Service-oriented computing: a research roadmap. *International Journal of Cooperative Information Systems,* 17**,** 223-255.
Papazoglou, M. P., Van Den Heuvel, W.-J. 2006. Service-oriented design and development methodology. *International Journal of Web Engineering and Technology,* 2**,** 412-442.
Paraskevaidis, P., Andriotis, K. 2017. Altruism in tourism: Social exchange theory vs altruistic surplus phenomenon in host volunteering. *Annals of Tourism Research,* 62**,** 26-37.
Parker, M. M., Benson, R. J. 1989. Enterprisewide information management: State-of-the-art strategic planning. *Information System Management,* 6**,** 14-23.
Parmenter, D. 2015. *Key performance indicators: developing, implementing, and using winning KPIs*, John Wiley & Sons.
Paulsen, M. 2002. Online education systems in Scandinavian and Australian universities: A comparative study. *The International Review of Research in Open and Distributed Learning,* 3.
Pereira, C. M., Sousa, P. A method to define an Enterprise Architecture using the Zachman Framework. Proceedings of the 2004 ACM symposium on Applied computing, 2004. ACM, 1366-1371.
Phillips, P. A. 2007. The balanced scorecard and strategic control: a hotel case study analysis. *The Service Industries Journal,* 27**,** 731-746.
Pickard, A. 2012. *Research methods in information*, Facet publishing.
Pickard, A. J. 2002. *ACCESS TO ELECTRONIC INFORMATION RESOURCES: THEIR ROLE IN THE PROVISION OF LEARNING OPPORTUNITIES FOR YOUNG PEOPLE. A CONSTRUCTIVIST INQUIRY.* University of Northumbria at Newcastle.
Pirani, J. A., Salaway, G. 2004. Information technology alignment in higher education. *EDUCAUSE Center for Applied Research (ECAR) Roadmap*.
Platts, K. W., Gregory, M. J. 1990. Manufacturing audit in the process of strategy formulation. *International Journal of Operations & Production Management,* 10**,** 5-26.
Plazaola, L., Silva, E., Vargas, N., Flores, J., Ekstedt, M. A Metamodel for strategic business and IT alignment assessment. Proceedings of the 4th Annual Conference on Systems Engineering Research (CSER), 2006.
Polit, D. F., Beck, C. T. 2004. *Nursing research: Principles and methods*, Lippincott Williams & Wilkins.
Porter, M. 1998. On Competition, Boston. *Harvard Business Review Books*.
Porter, M. E. 1985. *Competitive Advantage,* New York, The Free Press.
Porter, M. E. 1996. What is strategy? *Published November*.
Porter, M. E., Millar, V. E. 1985. How information gives you competitive advantage. Harvard Business Review, Reprint Service.

Preble, J. F. 2005. Toward a comprehensive model of stakeholder management. *Business and Society Review,* 110**,** 407-431.

Preston, D. S., Karahanna, E. 2009. Antecedents of IS strategic alignment: a nomological network. *Information Systems Research,* 20**,** 159-179.

Preston, R. 2014. *CIO Worries: Security, Talent & (Sadly) 'Alignment'* [Online]. Information Week. Available: http://www.informationweek.com/strategic-cio/digital-business/cio-worries-security-talent-and-(sadly)-alignment/a/d-id/1315575 [Accessed 13 August 2015].

Price, L., Richardson, J. T., Jelfs, A. 2007. Face-to-face versus online tutoring support in distance education. *Studies in Higher Education,* 32**,** 1-20.

Purao, S. 2002. Design research in the technology of information systems: Truth or dare. *GSU Department of CIS Working Paper*.

Qin, J., Liu, K., Han, J. Service valuation in business and IT alignment: with a case study in banking in China. Management of Innovation and Technology (ICMIT), 2010 IEEE International Conference on, 2010. IEEE, 390-395.

Queiroz, M., Coltman, T., Sharma, R., Tallon, P., Reynolds, P. 2012. Strategic IT alignment: an evaluation and process-level reconceptualization of the construct.

Quesada, H., Gazo, R. 2007. Methodology for determining key internal business processes based on critical success factors: A case study in furniture industry. *Business Process Management Journal,* 13**,** 5-20.

Rasmussen, J. 2000. Human factors in a dynamic information society: where are we heading? *Ergonomics,* 43**,** 869-879.

Ray, G., Muhanna, W. A., Barney, J. B. 2007. Competing with IT: The role of shared IT-business understanding. *Communications of the ACM,* 50**,** 87-91.

Reason, P., Bradbury, H. 2001. *Handbook of action research: Participative inquiry and practice*, Sage.

Reddy, V. K., Dubey, A., Lakshmanan, S., Sukumaran, S., Sisodia, R. 2009. Evaluating legacy assets in the context of migration to SOA. *Software Quality Journal,* 17**,** 51-63.

Reich, B. H., Benbasat, I. 1996. Measuring the linkage between business and information technology objectives. *MIS quarterly***,** 55-81.

Reich, B. H., Benbasat, I. 2000. Factors that influence the social dimension of alignment between business and information technology objectives. *MIS quarterly***,** 81-113.

Reynolds, P., Yetton, P. 2015. Aligning business and IT strategies in multi-business organizations. *Journal of Information Technology,* 30**,** 101-118.

Richardson, J. T. 2005. Instruments for obtaining student feedback: A review of the literature. *Assessment & Evaluation in Higher Education,* 30**,** 387-415.

Rimal, R. N., Lapinski, M. K. 2015. A Re-Explication of Social Norms, Ten Years Later. *Communication Theory,* 25**,** 393-409.

Rondinelli, D., Rosen, B., Drori, I. 2001. The struggle for strategic alignment in multinational corporations:: Managing readjustment during global expansion. *European Management Journal,* 19**,** 404-416.

Rosen, M., Lublinsky, B., Smith, K. T., Balcer, M. J. 2012. *Applied SOA: service-oriented architecture and design strategies*, John Wiley & Sons.

Rosenshine, B. 1983. Teaching functions in instructional programs. *The elementary school Journal,* 83**,** 335-351.

Rowley, J. 1997. Beyond service quality dimensions in higher education and towards a service contract. *Quality Assurance in Education,* 5**,** 7-14.

Russel Bernard, H. 1988. Research methods in cultural anthropology. Sage, London.

Ryan, S. D., Harrison, D. A. 2000. Considering social subsystem costs and benefits in information technology investment decisions: A view from the field on anticipated payoffs. *Journal of Management Information Systems***,** 11-40.

Sabharwal, N., Wali, P. 2013. Capacity Analysis, Tuning, and Review. *Cloud Capacity Management.* Springer.

Sabherwal, R., Chan, Y. E. 2001. Alignment between business and IS strategies: A study of prospectors, analyzers, and defenders. *Information systems research,* 12**,** 11-33.

Salter, A., Liu, K. Using Semantic Analysis and Norm Analysis to Model Organisations. ICEIS, 2002. 847-850.

Sarros, J. C., Gray, J., Densten, I. L., Cooper, B. 2005. The organizational culture profile revisited and revised: An Australian perspective. *Australian Journal of Management,* 30**,** 159-182.
Scheepers, H., Scheepers, R. 2008. A process-focused decision framework for analyzing the business value potential of IT investments. *Information Systems Frontiers,* 10**,** 321-330.
Schilling, M. A. 2000. Toward a general modular systems theory and its application to interfirm product modularity. *Academy of management review,* 25**,** 312-334.
Schlosser, F., Beimborn, D., Weitzel, T., Wagner, H.-T. 2015. Achieving social alignment between business and IT–an empirical evaluation of the efficacy of IT governance mechanisms. *Journal of Information Technology,* 30**,** 119-135.
Schwerdtner, W., Siebert, R., Busse, M., Freisinger, U. B. 2015. Regional open innovation roadmapping: A new framework for innovation-based regional development. *Sustainability,* 7**,** 2301-2321.
Seddon, P. B., Graeser, V., Willcocks, L. P. 2002. Measuring organizational IS effectiveness: an overview and update of senior management perspectives. *ACM SIGMIS Database,* 33**,** 11-28.
Seeman, E. D., O'hara, M. 2006. Customer relationship management in higher education: Using information systems to improve the student-school relationship. *Campus-Wide Information Systems,* 23**,** 24-34.
Sheets, R. G., Crawford, S. 2012. Harnessing the Power of Information Technology: Open Business Models in Higher Education. *Educause Review,* 47**,** (2).
Silvius, A., De Waal, B., Smit, J. 2009. Business and IT alignment; answers and remaining questions. *PACIS 2009 Proceedings***,** 44.
Silvius, A. G. Business & IT Alignment in theory and practice. System Sciences, 2007. HICSS 2007. 40th Annual Hawaii International Conference on, 2007. IEEE, 211b-211b.
Silvius, G. 2009. Alignment and strategy; the chicken or the egg?. *In 2nd Conf-IRM conference*, AlAin, UAE.
Simon, H. A. 1996. *The sciences of the artificial*, MIT press.
Smaczny, T. 2001. Is an alignment between business and information technology the appropriate paradigm to manage IT in today's organisations? *Management Decision,* 39**,** 797-802.
Smith, L., Abouammoh, A. 2013. Higher education in Saudi Arabia: Reforms, challenges and priorities. *Higher Education in Saudi Arabia*. Springer.
Smith, L. R., Cavusgil, S. T. 1984. Marketing planning for colleges and universities. *Long Range Planning,* 17**,** 104-117.
Soni, N., Jha, S. 2014. Component Based Software Development: A New Paradigm. *International Journal Of Scientific Research And Education,* 2.
Sonnenberg, C., Vom Brocke, J. 2012. Evaluations in the science of the artificial–reconsidering the build-evaluate pattern in design science research. *Design Science Research in Information Systems. Advances in Theory and Practice***,** 381-397.
Sowa, J. F., Zachman, J. A. 1992. Extending and formalizing the framework for information systems architecture. *IBM systems journal,* 31**,** 590-616.
Sprecher, S., Metts, S. 1999. Romantic beliefs: Their influence on relationships and patterns of change over time. *Journal of Social and Personal Relationships,* 16**,** 834-851.
Sridhar, S. 2015. A Review on Reuse of Software Components for Sustainable Solutions in Development Process. *IJITR,* 3**,** 1998-2001.
Stake, R. 1994. Case studies. InN. K. Denzin & YS Lincoln (Eds.), Handbook of qualitative research (pp. 236-247). Thousand Oaks, CA: Sage.
Stamper, R. 1985. Knowledge as action: a logic of social norms and individual affordances. *Social Action and Artificial Intelligence***,** 172-191.
Stamper, R. 1988. Analysing the cultural impact of a system. *International Journal of Information Management,* 8**,** 107-122.
Stamper, R., Liu, K. 1994. Organisational dynamics, social norms and information systems. *In HICSS,* 4, 645-654.
Stamper, R., Liu, K., Hafkamp, M., Ades, Y. Signs plus norms—one paradigm for organisation semiotics. 1st Int. Workshop on Computational Semiotics, 1997.
Stamper, R., Liu, K., Hafkamp, M., Ades, Y. 2000. Understanding the roles of signs and norms in organizations-a semiotic approach to information systems design. *Behaviour & Information Technology,* 19**,** 15-27.

Stenhouse, L. 1984. Library access, library use and user education in academic sixth forms: An autobiographical account. *The research process in educational settings: Ten case studies*, 211.

Stratopoulos, T., Dehning, B. 2000. Does successful investment in information technology solve the productivity paradox? *Information & management,* 38**,** 103-117.

Sun, L., Liu, K., Jambari, D. I., Michell, V. 2014. Evaluating business value of IT towards optimisation of the application portfolio. *Enterprise Information Systems***,** 1-22.

Swan, W., Kyng, E. 2004. An introduction to key performance indicators. *Center for Construction Innovation.–2004*.

Tallon, P. 2003. *The alignment paradox* [Online]. Available: http://www.cioinsight.com/c/a/Past-News/Paul-Tallon-The-Alignment-Paradox [Accessed 12 August 2015].

Tallon, P., Pinsonneault, A. 2011. Competing perspectives on the link between strategic information technology alignment and organizational agility: insights from a mediation model. *Mis Quarterly,* 35**,** 463-486.

Tallon, P. P., Kraemer, K. L., Gurbaxani, V. 2000. Executives' perceptions of the business value of information technology: a process-oriented approach. *Journal of Management Information Systems***,** 145-173.

Tapscott, D., Caston, A. 1993. *Paradigm Shift: The New Promise of Information Technology*, ERIC.

Tarafdar, M., Ragu-Nathan, T. 2015. BUSINESS–INFORMATION SYSTEMS ALIGNMENT. *Planning for Information Systems***,** 34.

Tareen, S. 2014. UoR Application Architecture. Information Technology Department, University of Reading. UK.

Tashakkori, A., Teddlie, C. 1998. *Mixed methodology: Combining qualitative and quantitative approaches*, Sage.

Teo, T. S., Ang, J. S. 2001. An examination of major IS planning problems. *International Journal of Information Management,* 21**,** 457-470.

The Open Group. 2013. *ArchiMate® 2.1 Specification* [Online]. Available: http://pubs.opengroup.org/architecture/archimate2-doc/ [Accessed 13 November 2015].

The Open Group. 2017. *ArchiMate® 3.0.1 Specification* [Online]. Available: http://pubs.opengroup.org/architecture/archimate3-doc/toc.html [Accessed 11 August 2017].

The Saudi Egovernment Program. 2016. *Government services and maturity levels indicators* [Online]. Available: http://www.yesser.gov.sa/en/transformation_Indicators/services_indicator/Pages/Government%20services%20and%20maturity%20levels%20indicators.aspx [Accessed 03 March 2017].

Tiwana, A., Bush, A. Peer-to-peer valuation as a mechanism for reinforcing active learning in virtual communities: actualizing social exchange theory. System Sciences, 2000. Proceedings of the 33rd Annual Hawaii International Conference on, 2000. IEEE, 10 pp. vol. 1.

Torkzadeh, G., Doll, W. J. 1999. The development of a tool for measuring the perceived impact of information technology on work. *Omega,* 27**,** 327-339.

Treacy, M., Wiersema, F. D. 1997. *The discipline of market leaders: Choose your customers, narrow your focus, dominate your market*, Basic Books.

Tribal Group. 2016. *SITS:Vision* [Online]. Available: http://www.tribalgroup.com/ [Accessed 23 May 2016].

Trischler, W. E. 1996. *Understanding and Applying Value-Added Assessment: Eliminating Business Process Waste*, ASQ Quality Press.

Trist, E. L., Bamforth, K. W. 1951. Some social and psychological consequences of the Longwall Method of coal-getting: An examination of the psychological situation and defences of a work group in relation to the social structure and technological content of the work system. *Human relations,* 4**,** 3-38.

Ullah, A., Lai, R. 2011. Modeling business goal for business/it alignment using requirements engineering. *Journal of Computer Information Systems,* 51**,** 21.

Ullah, A., Lai, R. 2013. A systematic review of business and information technology alignment. *ACM Transactions on Management Information Systems (TMIS),* 4**,** 4.

University of Reading. 2016. *Reading Integrated Student Information System* [Online]. Available: https://www.reading.ac.uk/internal/RISIS/ [Accessed 21 May 2016].

Urbaczewski, L., Mrdalj, S. 2006. A comparison of enterprise architecture frameworks. *Issues in Information Systems,* 7**,** 18-23.
Vaishnavi, V. K., Kuechler, W. 2015. *Design science research methods and patterns: innovating information and communication technology*, CRC Press.
Van Der Raadt, B., Van Vliet, H. 2009. Assessing the efficiency of the enterprise architecture function. *Advances in Enterprise Engineering Ii.* Springer.
Van Eck, P., Blanken, H., Wieringa, R. 2004. Project GRAAL: Towards operational architecture alignment. *International Journal of Cooperative Information Systems,* 13**,** 235-255.
Vargas Chevez, N. 2010. A unified strategic business and IT alignment model: A study in the public universities of Nicaragua.
Veenman, S., Denessen, E., Van Den Oord, I., Naafs, F. 2003. Direct and activating instruction: Evaluation of a preservice course. *The Journal of experimental education,* 71**,** 197-225.
Venkatraman, N. 1989. The concept of fit in strategy research: Toward verbal and statistical correspondence. *Academy of management review,* 14**,** 423-444.
Vergidis, K., Tiwari, A., Majeed, B. 2006. Business process improvement using multi-objective optimisation. *BT Technology Journal,* 24**,** 229-235.
Vergidis, K., Tiwari, A., Majeed, B. 2008. Business process analysis and optimization: Beyond reengineering. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews),* 38**,** 69-82.
Vernadat, F. B. 2002. Enterprise modeling and integration (EMI): Current status and research perspectives. *Annual Reviews in Control,* 26**,** 15-25.
Vicente, K. J. 1999. *Cognitive work analysis: Toward safe, productive, and healthy computer-based work*, CRC Press.
Vom Brocke, J., Braccini, A. M., Sonnenberg, C., Spagnoletti, P. 2014. Living IT infrastructures—an ontology-based approach to aligning IT infrastructure capacity and business needs. *International Journal of Accounting Information Systems,* 15**,** 246-274.
Wagner, H.-T., Weitzel, T. 2006. Operational IT business alignment as the missing link from IT strategy to firm success. *AMCIS 2006 Proceedings***,** 74.
Wagner, H.-T., Weitzel, T. 2012. How to achieve operational business-IT alignment: Insights from a global aerospace firm. *MIS Quarterly Executive,* 11**,** 25-35.
Waligo, V., Clarke, J., Hawkins, R. 2014. The 'Leadership–Stakeholder Involvement Capacity'nexus in stakeholder management. *Journal of Business Research,* 67**,** 1342-1352.
Walker, G. H., Stanton, N. A., Salmon, P. M., Jenkins, D. P. 2008. A review of sociotechnical systems theory: a classic concept for new command and control paradigms. *Theoretical Issues in Ergonomics Science,* 9**,** 479-499.
Walls, J. G., Widmeyer, G. R., El Sawy, O. A. 1992. Building an information system design theory for vigilant EIS. *Information systems research,* 3**,** 36-59.
Walsh, I. 2014. A strategic path to study IT use through users' IT culture and IT needs: A mixed-method grounded theory. *The Journal of Strategic Information Systems,* 23**,** 146-173.
Walsham, G. 1995. The emergence of interpretivism in IS research. *Information systems research,* 6**,** 376-394.
Walsham, G. 2006. Doing interpretive research. *European journal of information systems,* 15**,** 320-330.
Wastiau, P., Blamire, R., Kearney, C., Quittre, V., Van De Gaer, E., Monseur, C. 2013. The use of ICT in education: a survey of schools in Europe. *European Journal of Education,* 48**,** 11-27.
Watty, K. 2003. When will academics learn about quality? *Quality in Higher Education,* 9**,** 213-221.
Wei, Y., Blake, M. B. 2010. Service-oriented computing and cloud computing: challenges and opportunities. *IEEE Internet Computing***,** 72-75.
Weiss, J. W., Anderson, D. Aligning technology and business strategy: Issues & frameworks, a field study of 15 companies. System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference on, 2004. IEEE, 10 pp.
Wetzstein, B., Leitner, P., Rosenberg, F., Brandic, I., Dustdar, S., Leymann, F. Monitoring and analyzing influential factors of business process performance. Enterprise Distributed Object Computing Conference, 2009. EDOC'09. IEEE International, 2009a. IEEE, 141-150.
Wetzstein, B., Strauch, S., Leymann, F. Measuring performance metrics of WS-BPEL service compositions. Networking and Services, 2009. ICNS'09. Fifth International Conference on, 2009b. IEEE, 49-56.

Wetzstein, B., Zengin, A., Kazhamiakin, R., Marconi, A., Pistore, M., Karastoyanova, D., Leymann, F. 2012. Preventing KPI violations in business processes based on decision tree learning and proactive runtime adaptation. *Journal of Systems Integration,* 3**,** 3.

Whitt, W. 1999. Improving service by informing customers about anticipated delays. *Management science,* 45**,** 192-207.

Whitten, D., Wakefield, R. L. 2006. Measuring switching costs in IT outsourcing services. *The Journal of Strategic Information Systems,* 15**,** 219-248.

Williamson, K. 2002. *Research methods for students, academics and professionals: Information management and systems*, Elsevier.

Wong, T. C., Ngan, S.-C., Chan, F. T., Chong, A. Y.-L. 2012. A two-stage analysis of the influences of employee alignment on effecting business–IT alignment. *Decision Support Systems,* 53**,** 490-498.

Wout, J., Waage, M., Hartman, H., Stahlecker, M., Hofman, A. 2010. *The integrated architecture framework explained: why, what, how*, Springer.

Wu, S. P.-J., Straub, D. W., Liang, T.-P. 2014. How information technology governance mechanisms and strategic alignment influence organizational performance: Insights from a matched survey of business and IT managers. *MIS Quarterly*.

Xin, C. Service-oriented architecture in business. 2009 ISECS International Colloquium on Computing, Communication, Control, and Management, 2009. 521-524.

Yan, Z., Wang, T., Chen, Y., Zhang, H. 2016. Knowledge sharing in online health communities: A social exchange theory perspective. *Information & Management,* 53**,** 643-653.

Yayla, A. A., Hu, Q. 2012. The impact of IT-business strategic alignment on firm performance in a developing country setting: exploring moderating roles of environmental uncertainty and strategic orientation. *European Journal of Information Systems,* 21**,** 373-387.

Yetton, P. W., Johnston, K. D. 2001. Competing forms of fit in a professional bureaucracy: IT management dilemmas. *International Journal of Healthcare Technology and Management,* 3**,** 142-159.

Yin, R. K. 2013. *Case study research: Design and methods*, Sage publications.

Yujie, N., Xindi, W. Research on the matching of IT strategic planning and business strategy. Computer Science and Information Technology (ICCSIT), 2010 3rd IEEE International Conference on, 2010. IEEE, 177-181.

Zachman, J. A. 1987. A framework for information systems architecture. *IBM systems journal,* 26**,** 276-292.

Zachman, J. A. 1996. Concepts of the framework for enterprise architecture. *Los Angels, CA.*

Zajac, E. J., Kraatz, M. S., Bresser, R. K. 2000. Modeling the dynamics of strategic fit: A normative approach to strategic change. *Strategic management journal,* 21**,** 429-453.

Zeithaml, V. A., Berry, L. L., Parasuraman, A. 1993. The nature and determinants of customer expectations of service. *Journal of the academy of Marketing Science,* 21**,** 1-12.

Zhao, J. L., Goul, M., Purao, S., Vitharana, P., Wang, H. J. 2008. Impact of service-centric computing on business and education. *Communications of the Association for Information Systems,* 22**,** 16.

Zigurs, I., Buckland, B. K., Connolly, J. R., Wilson, E. V. 1999. A test of task-technology fit theory for group support systems. *ACM SIGMIS Database,* 30**,** 34-50.

Zweekhorst, M. B., Maas, J. 2015. ICT in higher education: students perceive increased engagement. *Journal of Applied Research in Higher Education,* 7**,** 2-18.

Appendix A The List of Abbreviations

ADM	Architecture Development Method
BCA	Business Context Analysis
B-ITAAM	Business and IT Alignment Assessment Method
BITAM	Business and IT Alignment Method
BPML	Business Process Modelling Language
BPMN	Business Process Modelling Notation
BSE	Business Service Efficiency
BSSV	Business Service Strategic Value
CATWOE	Clients, Actors, Transformation process, Worldview, Ownership, and Environmental constraints
CEO	Chief Executive Officer
CIO	Chief Information Officer
CSFs	Critical Success Factors
CWA	Cognitive Work Analysis
DSR	Design Science Research
EA	Enterprise Architecture
FG	Financial Gains
HE	Higher Education
HEIs	Higher Education Institutions
IAF	Integrated Architecture Framework
ICT	Information and Communication Technologies
IDEF	Integration DEFinition
IS	Information Systems
ISC	Information Systems Capability
ISCB	IS Criticality to the Business Service
IT	Information Technology
ITA	IT Application
ITACs	IT Application Components
ITQ	IT Quality
ITU	IT Usage
KPIs	Key Performance Indicators
MEASUR	Method of Eliciting, Analysing and Specifying Users' Requirements
NAM	Norm Analysis Method
OS	Organisational Semiotics
PBSP	Perceived Business Service Performance
PIs	Performance Indicators
R_B	Relative_Benefit
REST	Representational State Transfer
SAM	Strategic Alignment Model
SET	Social Exchange Theory
SIM	Society for Information Management
SLAs	Service-Level Agreements
SMSs	Student Management Services
SOA	Service-Oriented Architecture
SOAP	Simple Object Access Protocol
SOC	Service-Oriented Computing
SSM	Soft System Methodology
STS	Socio Technical Systems

T&L	Teaching and Learning
TAM	Technology Acceptance Model
TOGAF	The Open Group Architecture Framework
TTF	Task Technology Fit
UML	Unified Modelling Language
UPV	Users' Perceived Value
WSDL	Web Service Description Language
XML	Extensible Mark-up Language

Appendix B The Questionnaire for Developing the Solution

This open-ended questionnaire is designed to determine the assessment factors that can be used as evaluation criteria to evaluate business and IT alignment at the operational level of an organisation. It is also designed to check the feasibility of applying the B-ITAAM in higher education institutions. Four IT/IS experts from Albaha University attended this questionnaire, providing feedback on the assessment factors used in the B-ITAAM and also feedback on the evaluation approach to be developed to carry out the assessment of business and IT alignment.

Name (optional):
Qualifications:
Job title(s):

A. During the last decade, business and IT alignment has been proven to be a top concerning issue for IT leaders in many public and private organisations. Universities are among these organisations where IT leaders face difficulties to effectively align IT capabilities with the university business needs. A set of technical (tangible) and social (intangible) factors have been identified in the literature to influence the value of this alignment at the operational level of an organisation. These factors are mentioned in the following list. Please specify to what extent do you agree or disagree if these factors are also applicable to influence the value of business and IT alignment in higher education institutions (i.e. universities).

1. Stakeholders' perceptions about the quality of offered business services by the university such as teaching, learning and management services.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
2. Stakeholders' perceptions about the usability and usefulness of IT systems aimed to support offered services.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
3. Strategic value of business services (i.e. the more strategically important the business service is to the university, the more the need for effective IT solution to support it).
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
4. The financial gains or benefits from the implementation and usage of IT systems invested in by the university in terms of saved costs, increased level of performance and efficiency.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
5. The usage pattern of IT systems invested in by the university to support stakeholders' needs.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
6. The technical quality of an IT system in terms of functionality, adaptability, response time, etc.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree

B. Being an academic staff and also an IT/IS expert at Albaha University IT centre, do you want to add factors/activities/concepts to the list of factors mentioned above as influencing factors on the value of business and IT alignment in higher education institutions in general, and in Albaha University in particular?
(…)

C. Please specify to what extent do you agree or disagree with the following statements as this will assist us to determine whether the developed solution to evaluate business and IT alignment is feasible to be applied in higher education institutions' context:

1. Business and IT alignment assessment at the operational level of a university must be conducted in regular basis, especially when IT investments are increasing and stakeholders' level of satisfaction is decreasing.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
2. Knowing which offered business services by a university are more important than the others can be identified according to the university's goals and strategies.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
3. Structuring and representing the university business operations and activities such as teaching, admission, module enrolment, etc. as services and similarly IT resources as IT services would facilitate the business and IT alignment assessment at the operational level of the university.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
4. Analysing business and IT services offered by a university from both technical and social perspectives to determine the value of business and IT alignment would provide more convincing outcomes that would almost indicate the true state of business and IT alignment at the university.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
5. A well-aligned business and IT services at the university would lead the university to experience better communication, collaboration and presence locally and globally.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree
6. The national and international ranking of a university can be improved dramatically if its business and IT services are maturely aligned.
   ( ) strongly disagree ( ) disagree ( ) agree ( ) strongly agree

D. Based on your experience, has the university ever carried out any business and IT alignment assessment in any scale? If yes, please specify.
Yes/ No
(...)

E. Please use this space for any additional comments with regard to the business and IT alignment assessment at the operational level of higher education institutions.
(...)

Appendix C The Pilot Survey Designed to Test the Quality of Offered Services at Albaha University

This pilot survey is designed to gain better understanding of the quality of offered services to students at Albaha University. It is translated to Arabic language from the UK's National Student Survey and was attended by 94 undergraduate students from the school of Computer Science and IT.

National Student Survey
Main Questionnaire

5	Definitely agree
4	Mostly agree
3	Neither agree nor disagree
2	Mostly disagree
1	Definitely disagree
N/A	Not applicable

The teaching on my course	5	4	3	2	1	N/A
1. Staff are good at explaining things.	☐	☐	☐	☐	☐	☐
2. Staff have made the subject interesting.	☐	☐	☐	☐	☐	☐
3. Staff are enthusiastic about what they are teaching.	☐	☐	☐	☐	☐	☐
4. The course is intellectually stimulating.	☐	☐	☐	☐	☐	☐
Assessment and feedback						
5. The criteria used in marking have been clear in advance.	☐	☐	☐	☐	☐	☐
6. Assessment arrangements and marking have been fair.	☐	☐	☐	☐	☐	☐
7. Feedback on my work has been prompt.	☐	☐	☐	☐	☐	☐
8. I have received detailed comments on my work.	☐	☐	☐	☐	☐	☐
9. Feedback on my work has helped me clarify things I did not understand.	☐	☐	☐	☐	☐	☐
Academic support						
10. I have received sufficient advice and support with my studies.	☐	☐	☐	☐	☐	☐
11. I have been able to contact staff when I needed to.	☐	☐	☐	☐	☐	☐
12. Good advice was available when I needed to make study choices.	☐	☐	☐	☐	☐	☐
Organisation and management						
13. The timetable works efficiently as far as my activities are concerned.	☐	☐	☐	☐	☐	☐
14. Any changes in the course or teaching have been communicated effectively.	☐	☐	☐	☐	☐	☐
15. The course is well organised and is running smoothly.	☐	☐	☐	☐	☐	☐

Learning resources	5	4	3	2	1	N/A
16. The library resources and services are good enough for my needs.	☐	☐	☐	☐	☐	☐
17. I have been able to access general IT resources when I needed to.	☐	☐	☐	☐	☐	☐
18. I have been able to access specialised equipment, facilities, or rooms when I needed to.	☐	☐	☐	☐	☐	☐
Personal development						
19. The course has helped me to present myself with confidence.	☐	☐	☐	☐	☐	☐
20. My communication skills have improved.	☐	☐	☐	☐	☐	☐
21. As a result of the course, I feel confident in tackling unfamiliar problems.	☐	☐	☐	☐	☐	☐
B2. Course Content and Structure						
▪ All of the compulsory modules are relevant to my course	☐	☐	☐	☐	☐	☐
▪ There is an appropriate range of options to choose from on my course	☐	☐	☐	☐	☐	☐
▪ The modules of my course form a coherent integrated whole	☐	☐	☐	☐	☐	☐
B5. Course Delivery						
▪ Learning materials made available on my course have enhanced my learning	☐	☐	☐	☐	☐	☐
▪ The range and balance of approaches to teaching has helped me to learn	☐	☐	☐	☐	☐	☐
▪ The delivery of my course has been stimulating	☐	☐	☐	☐	☐	☐
▪ My learning has benefited from modules that are informed by current research	☐	☐	☐	☐	☐	☐
▪ Practical activities on my course have helped me to learn	☐	☐	☐	☐	☐	☐
B8. Welfare Resources and Facilities						
▪ There is sufficient provision of welfare and student services to meet my needs	☐	☐	☐	☐	☐	☐
▪ When needed, the information and advice offered by welfare and student services has been helpful	☐	☐	☐	☐	☐	☐
22. Overall, I am satisfied with the quality of the course.	☐	☐	☐	☐	☐	☐

عزيزي الطالب/ عزيزتي الطالبة

يهدف هذا الاستبيان إلى التعرف على وجهة نظرك حول البرنامج/التخصص الدراسي الذي التحقت به في الجامعة. ووجهة نظرك التي سوف تقدمها في هذا الاستبيان، إلى جانب وجهات نظر زملائك سوف تُسهم في رسم المستقبل الأفضل للبرامج الدراسية المقدمة حاليا على مستوى الكليات في الجامعة. لذا نتمنى أن تكون وجهة نظرك التي سوف تقدمها ذات مصداقية عالية، لأنها سوف تنعكس إيجابيا على النتائج المرجوة من هذه الدراسة.

أيضا نود التأكيد على أن جميع البيانات التي سوف تقوم بإدخالها في هذا الاستبيان سوف تعامل بسرية تامة، وستستخدم لأغراض البحث فقط.

هذا الاستبيان يتألف من (9 محاور)، وتتضمن هذه المحاور (31) عبارة. لذا الرجاء الإجابة عن جميع المحاور، مبينا فيما إذا كنت تتفق أو لا تتفق مع العبارات المذكورة في ضوء البرنامج الدراسي الذي أتممته في الفصل السابق، أو تدرسه حاليا. وإذا كانت إجابتك تتراوح بين الاتفاق وعدم الاتفاق، فالرجاء اختيار الخيار (محايد)، وأخيرا إذا كنت ترى أن بعض هذا العبارات غير موجودة أو متحققة في برنامجك الدراسي، فالرجاء اختيار الخيار (لا ينطبق).

	أتفق تماما	أتفق	محايد	لا أتفق	لا أتفق إطلاقا	لا ينطبق
المحور الأول: طريقة التدريس في برنامجي الدراسي						
1- الأساتذة جيدون في شرح وتوضيح الأشياء.						
2- الأساتذة لديهم القدرة لجعل المقررات التي أدرسها ممتعة وشيقة.						
3- الأساتذة متحمسون جدا للشيء الذي يقدمونه.						
4- برنامجي الدراسي يحفز على التفكير، كالتفكير الناقد والإبداعي.						
المحور الثاني: التقييم والتغذية الراجعة						
5- معايير التقييم كانت واضحة مسبقا بالنسبة لي.						
6- طريقة التقييم كانت عادلة ومنظمة.						
7- التغذية الراجعة لواجباتي وأبحاثي كانت سريعة.						
8- التغذية الراجعة التي أحصل عليها كانت دقيقة وشاملة.						
9- التغذية الراجعة ساعدتني على فهم أشياء لم أكن أفهمها جيدا.						
المحور الثالث: الدعم الأكاديمي						
10-حصلت على النصح والدعم اللازم خلال دراستي في البرنامج الدراسي.						
11-لقد كنت قادرا على التواصل مع الأساتذة بسهولة عندما يتطلب الأمر ذلك.						
12-النصح والتوجيه كان دومًا متاحًا لي خلال دراستي في البرنامج الدراسي.						
المحور الرابع: التنظيم والإدارة						
13-الجدول الدراسي متناسب تمامًا مع المهمات والواجبات التي يتطلب مني إنجازها.						
14-أي تغيير يطرأ على برنامجي الدراسي يتم إخباري به مباشرة.						
15-برنامجي الدراسي معد بشكل جيد، وينفذ بسلاسة.						
المحور الخامس: مصادر التعلم						
16-المصادر والخدمات التي تقدمها المكتبة جيدة، وتتناسب مع احتياجاتي المختلفة.						
17-لدي القدرة في الوصول للمصادر والخدمات التقنية حال تطلب الأمر ذلك.						

18-لدي القدرة في الوصول لأجهزة ومعدات مخصصة، وقاعات معينة عندما احتاج لذلك.						
المحور السادس: التطور على المستوى الشخصي						
19-ساعدني البرنامج الدراسي على أن أبرز شخصيتي بثقة عالية.						
20-مهاراتي في الاتصال مع الآخرين تطورت خلال دراستي في البرنامج الدراسي.						
21-أحد نتائج الانضمام لهذا البرنامج الدراسي، هو أنني أستطيع أن أواجه المشاكل الجديدة بثقة أكبر.						
المحور السابع: محتويات وبناء البرنامج الدراسي						
22-جميع المقررات الإجبارية التي درستها ذات علاقة مباشرة ببرنامجي الدراسي.						
23-هناك خيارات كثيرة ومناسبة بالنسبة للمواد الاختيارية التي يمكنني أن اختار من بينها في برنامج الدراسي.						
24-جميع المقررات الأساسية والاختيارية في برنامجي الدراسي تُشكل وحدة مترابطة لبرنامج دراسي جيد.						
المحور الثامن: طريقة توصيل المقررات الدراسية						
25-الوسائل والأدوات التعليمية المتاحة في برنامجي الدراسي كان لها القدرة على تحفيزي للتعلم.						
26-طريقة توصيل المقررات الدراسية كانت محفزة.						
27-تعلمت الكثير من المقررات الدراسية التي تحتوي على معارف جديدة.						
28-الجانب العملي في برنامجي الدراسي ساعدني كثيرا في أن أتعلم.						
المحور التاسع: مصادر ومرافق الخدمات الطلابية						
29-هناك العديد من المرافق والمصادر والخدمات الطلابية التي تلبي احتياجاتي المختلفة.						
30-المعلومات والنصائح المقدمة من قبل عمادة شئون الطلاب ساعدتني كثيرًا في مواقف معينة.						
31-بشكل عام، أنا راضٍ تمامًا عن جودة البرنامج الدراسي الذي التحقت به في الجامعة.						

بناء على دراستك لبرنامجك الدراسي في الجامعة، هل هناك أمور إيجابية أو سلبية محددة تود الإشارة إليها؟
الإيجابيات:
السلبيات:

شكرا جزيلا على المشاركة في إتمام هذا الاستبيان، ونتمنى لك مزيدا من التقدم والتوفيق.

Appendix D Experts' Acceptance Questionnaire

This open-ended questionnaire is designed to evaluate the acceptance of the B-ITAAM from experts' point of view. Nine IT/IS experts from Albaha University attended this questionnaire providing feedback on the feasibility, usability and usefulness of the developed solution to evaluate business and IT alignment.

- Please select your job title:

  ( ) Full professor in IS
  ( ) Associate professor in IS
  ( ) Assistant professor in IS

- Please specify (if any) other job type that you are assigned to perform at Albaha University: _____

In regard to the presented approach and outcomes of the Business and IT Alignment Assessment Method (B-ITAAM), please evaluate each of the following criteria according to the following scale: (1) definitely not satisfied, (2) a little satisfied, (3) somewhat satisfied, (4) very satisfied and (5) extremely satisfied:

A. Feasibility:

1. The B-ITAAM and its business analysis techniques can be done in real life cases.
   ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5
2. The links or relationships between different business analysis techniques in B-ITAAM provide right information flow at the right time to assist for business and IT alignment assessment.
   ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

Please write your comments (if any) about the feasibility of the B-ITAAM: _____

_____

B. Usability:

1. The business analysis techniques defined in B-ITAAM are clear, understandable and therefore easy to follow.

   ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

2. The business analysis techniques defined in B-ITAAM are easy to apply?

   ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

3. B-ITAAM supports the assessment of complex business and IT alignment relationships in a simple manner.

   ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

4. Where needed, the evaluation of the business and IT alignment can enter any stage of the B-ITAAM defined stages of evaluation.

   ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

5. Where needed, new evaluation factors can be incorporated in B-ITAAM without redesigning the whole method.

( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

Please write your comments (if any) about the usability of the B-ITAAM: _____

_____

C. Usefulness:

1. B-ITAAM serves the purpose of comprehensively evaluating business and IT alignment at the operational level guided by strategic aspects of the organisation.

( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

2. Using B-ITAAM would improve the assessment of BITA at operational level of organisations focusing on strategically important services.

( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

3. B-ITAAM produces results that are helpful to the organisation.

( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

4. B-ITAAM produces results of high quality that reflect on the intensive assessment carried out by B-ITAAM.

( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

5. B-ITAAM can assist for business and IT alignment assessment to be carried out in any public sector organisation?

( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

Please write your comments (if any) about the usefulness of the B-ITAAM: _____

_____

Appendix E The Set of Questionnaires Used by Albaha University Experts to Measure the Quality of Provided Services

The following set of questionnaires are used by Albaha University experts to measure the quality of offered services, programs and the academic environment at Albaha University. 530 students from the school of Computer Science and IT attended this set of questionnaires.

Student Evaluation Surveys

Students are the principle clients of the education system and surveys of their opinions are one of the most important sources of evidence about quality in higher education. They can provide very useful suggestions for improvement that should be considered in the quality cycle for improvement as applied to individual courses, programs, and institutional planning.

There are a number of general principles that should be followed if student surveys are to be as useful as possible.

- It must be made clear to students that all survey responses are anonymous.
- Course evaluation surveys should be distributed and collected by someone other than the course instructor.
- Surveys should include common questions to enable them to be used for comparisons within departments and colleges and institutions and between institutions. (The use of common questions does not prevent the addition of optional additional questions appropriate for different courses, programs or institutions.)
- Some open ended questions should be included to permit respondents to comment on additional matters of concern.
- In addition to a number of individual items relating to matters considered important, surveys can include one or two summary items that can be used as general quality indicators.
- To be used for benchmarking quality between institutions the surveys should be distributed in similar ways and at similar times and comparisons made between comparable institutions.
- Questions should be consistent over time (normally at least three years) so that valid trend data can be obtained.
- The validity of responses depends on having a reasonable response rate. Normally at least 50% is essential. To encourage participation:
    - Surveys should not be overused.
    - Use should be made of the responses, and summary reports and indications of action taken in response made available.
    - The surveys should not be too long. (a maximum of 20 to 25 items plus a small number of open ended items is usual)

Recommended Surveys

Three surveys are recommended:

1. Course Evaluation Survey (CES) A course evaluation survey that can be distributed at the end of a course. It is recommended that this survey be distributed in each course once each year and that it be distributed in at least one course taught by each instructor at least once each year. .

The survey does not directly assess the quality of teaching by individual instructors. However the evaluation of the course is seen as a reasonable measure of the quality of teaching in a way that minimizes personal issues that could inhibit responses from students.

The survey asks questions about a number of aspects of each course. The final question is intended to provide a summary question that might be used as a general quality indicator.

2. Student Experience Survey (SES) This is intended as a general survey that might be distributed to all students part way through their program—mid way through the second semester of the second year in a four year program is recommended.

The survey deals with the student's life at the institution including both major elements of the program in which they are enrolled and a number of general items relating to services and facilities. As for the SCE the final question is intended as a summary question that might be used as a general quality indicator.

3. Program Evaluation Survey (PES) This survey is intended for use at the time students have finished their program and are about to graduate. It is recommended that it be distributed shortly before final year classes are finished so their opinion of the total program at that stage can be assessed.

The questions include a number of items about the program itself together with some items similar to those in the SES that deal with their life as a student at the institution. As for the other surveys the final question is a summary item that might be used as a general quality indicator.

Response Scale

It is recommended that each item in the surveys be responded on a five point scale. The recommended scale is:

5 Strongly agree (with the statement)
4 Agree
3 Neutral (or undecided)
2 Disagree
1 Strongly disagree

The numbers shown here are not included on the survey forms. However those numbers should be used for summarizing responses from students and developing average responses to each item.

The survey forms have been prepared in a form that could be used for scanning. However the forms would need to be re-formatted to suit the requirements of any machine scoring system used in an institution.

Course Evaluation Survey (CES)

Course Title _____ Program _____

Semester _____ Year _____

Feedback from students is very important in trying to improve the quality of courses.

This is a confidential survey. Do not write your name or identify yourself in any way. Your responses will be combined with the responses of others in a process that does not allow any individual to be identified and the overall opinions will be used to plan for course improvements.

Please respond to the following questions by completely filling a response for each of your answers.

Do this ○ ● ○ ○ ○

Do not mark in any of these ways ✓ ○ ✗ ○ ◉

Use a pencil or blue/black pen only
Make heavy marks that fill in your response

Do not use red, green or yellow
Do not use highlighters

- Strongly agree means the statement is true all or almost all of the time and/or very well done.
- Agree means the statement is true most of the time and/or fairly well done.
- True sometimes means something is done about half the time.
- Disagree means something is done poorly or not often done.
- Strongly disagree means something is done very badly or never or very rarely done.

	Strongly Agree	*Agree*	*True Sometimes*	*Disagree*	*Strongly Disagree*
Questions about the start of the course:					
1. The course outline (including the knowledge and skills the course was designed to develop) was made clear to me.	○	○	○	○	○
2. The things I had to do to succeed in the course, including assessment tasks and criteria for assessment, were made clear to me.	○	○	○	○	○
3. Sources of help for me during the course including faculty office hours and reference material, were made clear to me.	○	○	○	○	○
Questions about what happened during the course:					
4. The conduct of the course and the things I was asked to do were consistent with the course outline.	○	○	○	○	○
5. My instructor(s) were fully committed to the delivery of the course. (Eg. classes started on time, instructor always present, material well prepared, etc)	○	○	○	○	○
6. My instructor(s) had thorough knowledge of the content of the course.	○	○	○	○	○
7. My instructor(s) were available during office hours to help me.	○	○	○	○	○
8. My instructor(s) were enthusiastic about what they were teaching	○	○	○	○	○
9 My instructor(s) cared about my progress and were helpful to me.	○	○	○	○	○
10. Course materials were of up to date and useful. (texts, handouts, references etc.)	○	○	○	○	○
11. The resources I needed in this course (textbooks, library, computers etc.) were available when I needed them.	○	○	○	○	○

12. In this course effective use was made of technology to support my learning. ○ ○ ○ ○ ○

13. .In this course I was encouraged to ask questions and develop my own ideas ○ ○ ○ ○ ○

14. In this course I was inspired to do my best work. ○ ○ ○ ○ ○

15. The things I had to do in this course (class activities, assignments, laboratories etc) were helpful for developing the knowledge and skills the course was intended to teach. ○ ○ ○ ○ ○

16. The amount of work I had to do in this course was reasonable for the credit hours allocated. ○ ○ ○ ○ ○

17. Marks for assignments and tests in this course were given to me within reasonable time. ○ ○ ○ ○ ○

18. Grading of my tests and assignments in this course was fair and reasonable. ○ ○ ○ ○ ○

19. The links between this course and other courses in my total program were made clear to me. ○ ○ ○ ○ ○

Evaluation of the Course

20. What I learned in this course is important and will be useful to me. ○ ○ ○ ○ ○

21. This course helped me to improve my ability to think and solve problems rather than just memorize information. ○ ○ ○ ○ ○

22. This course helped me to develop my skills in working as a member of a team. ○ ○ ○ ○ ○

23. This course improved my ability to communicate effectively. ○ ○ ○ ○ ○

Overall Evaluation

24. Overall, I was satisfied with the quality of this course. ○ ○ ○ ○ ○

Open Ended Items

25. What did you like most about this course?

_____

_____

_____

26. What did you dislike most about this course?

_____

_____

_____

27. What suggestion(s) do you have to improve this course?

_____

_____

_____

Student Experience Survey (SES)

Program Title _____

Semester_____Year_____

Feedback from students is very important in trying to improve the quality of learning experiences at higher education institutions.

This questionnaire is designed to gather student opinions about their experiences about half way through their program. The items relate to all your experiences so far, not just to one particular course.

This is a confidential survey. Do not write your name or identify yourself. Your responses will be combined with the responses of others in a process that does not allow any individual to be identified and the overall opinions will be used to plan for improvements in the quality of educational experiences at your institution.

Please respond to the following questions by completely filling a response for each of your answers.

Do this ○ ● ○ ○ ○ Do not mark in any of these ways. ✓ ○ ⊗ ○ ◉

Use a pencil or blue/black pen only
Make heavy marks that fill in your response

Do not use red, green or yellow
Do not use highlighters

- Strongly agree means the statement is true all or almost all of the time and/or very well done.
- Agree means the statement is true most of the time and/or fairly well done.
- True sometimes means something is done about half the time.
- Disagree means something is done poorly or not often done.
- Strongly disagree means something is done very badly or never or very rarely done.

	Strongly Agree	*Agree*	*True Sometimes*	*Disagree*	*Strongly Disagree*
Advice and Support					
1. It was easy to find information about the institution and its programs before I enrolled at this institution for the first time.	○	○	○	○	○
2. When I first started at this institution the orientation program for new students was helpful for me.	○	○	○	○	○
3. There is sufficient opportunity at this institution to obtain advice on my studies and my future career.	○	○	○	○	○
4. Procedures for enrolling in courses are simple and efficient.	○	○	○	○	○
Learning Resources and Facilities					
5. Classrooms (including lecture rooms, laboratories etc.) are attractive and comfortable.	○	○	○	○	○
6. Student computing facilities are sufficient for my needs.	○	○	○	○	○
7. The library staff are helpful to me when I need assistance.	○	○	○	○	○
8. I am satisfied with the quality and extent of materials available for me in the library.	○	○	○	○	○
9. The library is open at convenient times.	○	○	○	○	○
10. Adequate facilities are available for extra curricular activities (including sporting and recreational activities)	○	○	○	○	○

11. Adequate facilities are available at this institution for religious observances. ○ ○ ○ ○ ○

Learning and Teaching

12 Most of the faculty with whom I work at this institution are genuinely interested in my progress. ○ ○ ○ ○ ○

13. Faculty at this institution are fair in their treatment of students ○ ○ ○ ○ ○

14. My courses and assignments encourage me to investigate new ideas and express my own opinions. ○ ○ ○ ○ ○

15. As a result of my studies my ability to investigate and solve new and unusual problems is increasing ○ ○ ○ ○ ○

16. My ability to effectively communicate the results of investigations I undertake is improving as a result of my studies. ○ ○ ○ ○ ○

17. My program of studies is stimulating my interest in further learning. ○ ○ ○ ○ ○

18. The knowledge and skills I am learning will be valuable for my future career. ○ ○ ○ ○ ○

19. I am learning to work effectively in group activities. ○ ○ ○ ○ ○

Overall Evaluation

20. Overall I am satisfied with my life as a student at this institution. ○ ○ ○ ○ ○

Open Ended Questions

21. What do you like most about studying at this institution?

_____

_____

_____

_____

22. What do you dislike most about studying at this institution?

_____

_____

_____

_____

23. What suggestions do you have for improvements at this institution?

_____

_____

_____

_____

Program Evaluation Survey (PES)

Program Title _____

Semester_____Year_____

Feedback from students is very important in trying to improve the quality of programs.

This questionnaire is designed to gather opinions from final year students about their experiences at the institution throughout their program.

This is a confidential survey. Do not write your name or identify yourself. Your responses will be combined with the responses of others in a process that does not allow any individual to be identified and the overall opinions will be used to plan for improvements.

Please respond to the following questions by completely filling a response for each of your answers.

Do this ○ ● ○ ○ ○ Do not mark in any of these ways. ✓ ○ ⊗ ○ ◉

Use a pencil or blue/black pen only
Make heavy marks that fill in your response

Do not use red, green or yellow
Do not use highlighters

- Strongly agree means the statement is true all or almost all of the time and/or very well done.
- Agree means the statement is true most of the time and/or fairly well done.
- True sometimes means something is done about half the time.
- Disagree means something is done poorly or not often done.
- Strongly disagree means something is done very badly or never or very rarely done.

	Strongly Agree	Agree	True Sometimes	Disagree	Strongly Disagree
Help and Support for my Learning					
1. Adequate academic and career counselling was available for me throughout the program.	○	○	○	○	○
2. The instructors were available for consultation and advice when I needed to speak with them.	○	○	○	○	○
3. The instructors in the program inspired me to do my best.	○	○	○	○	○
4. The instructors in the program gave me helpful feedback on my work.	○	○	○	○	○
5. The instructors in the program had thorough knowledge of the content of the courses they taught.	○	○	○	○	○
6. The instructors were enthusiastic about the program.	○	○	○	○	○
7. The instructors cared about the progress of their students.	○	○	○	○	○
Resources to Support my Learning					
8. Study materials in courses were up to date and useful.	○	○	○	○	○
9. Library resources were adequate and available when I needed them.	○	○	○	○	○
10. Classroom facilities (for lectures, laboratories, tutorials etc) were of good quality.	○	○	○	○	○
11. Student computing facilities were sufficient for my needs.	○	○	○	○	○
12. Adequate facilities were available for extra curricular activities (including sporting and recreational activities).	○	○	○	○	○

13. Adequate facilities were available for religious observances. ○ ○ ○ ○ ○

14 Field experience programs (internship, practicum, cooperative training) were effective in developing my skills. (Omit this item if not applicable to your program) ○ ○ ○ ○ ○

Evaluation of my Learning

15 What I have learned in this program will be valuable for my future. ○ ○ ○ ○ ○

16. The program has helped me to develop sufficient interest to want to continue to keep up to date with new developments in my field of study. ○ ○ ○ ○ ○

17. The program has developed my ability to investigate and solve new problems. ○ ○ ○ ○ ○

18. The program has improved my ability to work effectively in groups. ○ ○ ○ ○ ○

19. The program has improved my skills in communication. ○ ○ ○ ○ ○

20. The program has helped me to develop good basic skills in using technology to investigate issues and communicate results. ○ ○ ○ ○ ○

21. I have developed the knowledge and skills required for my chosen career. ○ ○ ○ ○ ○

Overall Evaluation

22. Overall I was satisfied with the quality of my learning experiences at this institution. ○ ○ ○ ○ ○

Open Ended Items

23. What did you like most about your studies at this institution?

_____

_____

_____

24. What did you dislike most about your studies at this institution?

_____

_____

_____

25. What suggestions do you have for improvements in your program at this institution?

_____

_____

_____

_____

Appendix F Students' Perceptions of the Performance of the Admission Service

An illustration of the analysis of the *Admission Service* performance as it is perceived by 60 students from the first year group from the school of CS and IT at Albaha University.

			ST1	ST2	ST3	ST4	ST5	ST6	ST7	ST8	ST9	ST10	ST11	ST12	ST13	ST14	ST15
Number	Criteria	C.W / S.W	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
1	The offering of the business service is clearly defined	0.15	1.00	2.00	-3.00	0.00	3.00	2.00	2.00	-1.00	-1.00	-1.00	1.00	-3.00	1.00	2.00	-2.00
2	The business service is delivered to end consumer in a timely efficient manner	0.10	1.00	-1.00	-3.00	0.00	-1.00	1.00	0.00	-2.00	-1.00	-1.00	1.00	-3.00	1.00	-1.00	-2.00
3	The business service is deemed crucial to the end consumer	0.10	2.00	2.00	3.00	1.00	3.00	2.00	3.00	2.00	2.00	1.00	2.00	1.00	2.00	1.00	2.00
4	Risks can be imposed to the data of the business service consumer	0.15	1.00	-1.00	2.00	1.00	2.00	1.00	2.00	1.00	2.00	1.00	2.00	-2.00	1.00	1.00	1.00
5	A mechanism to provide feedback on business service offering is accessible	0.10	-1.00	-2.00	-1.00	-1.00	-2.00	-1.00	-1.00	-2.00	-1.00	-1.00	-2.00	-1.00	-1.00	-2.00	-1.00
6	Consumers can deal with the business service with no additional required knowledge and skills	0.15	3.00	2.00	1.00	2.00	3.00	2.00	1.00	3.00	1.00	2.00	3.00	2.00	1.00	3.00	1.00
7	End consumer's expectations from the business service are met	0.25	-1.00	-2.00	1.00	2.00	1.00	1.00	2.00	3.00	2.00	1.00	2.00	2.00	3.00	2.00	1.00
$V_i = \left(\sum_{j=1}^{7} sv_j \times cw_j\right) \times sw_i$			0.012	-0.002	0.002	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.00	0.02	0.02	0.00

ST16	ST17	ST18	ST19	ST20	ST21	ST22	ST23	ST24	ST25	ST26	ST27	ST28	ST29	ST30	ST31	ST32	ST33	ST34	ST35
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
2.00	-3.00	1.00	3.00	2.00	-1.00	-1.00	2.00	-1.00	-2.00	2.00	-1.00	2.00	-1.00	2.00	2.00	1.00	0.00	1.00	-2.00
1.00	-1.00	1.00	1.00	-2.00	1.00	-1.00	-1.00	1.00	-3.00	1.00	3.00	1.00	0.00	1.00	1.00	1.00	-2.00	1.00	0.00
2.00	1.00	2.00	3.00	2.00	1.00	2.00	2.00	1.00	0.00	2.00	2.00	0.00	2.00	3.00	2.00	0.00	1.00	2.00	1.00
1.00	2.00	-1.00	1.00	-2.00	1.00	-2.00	1.00	2.00	-1.00	1.00	1.00	2.00	1.00	-1.00	1.00	0.00	-2.00	1.00	2.00
-2.00	-1.00	1.00	1.00	2.00	-1.00	-2.00	-2.00	-1.00	-1.00	1.00	-2.00	-1.00	-2.00	1.00	1.00	2.00	-1.00	-1.00	2.00
1.00	1.00	2.00	2.00	2.00	1.00	0.00	1.00	-1.00	2.00	1.00	2.00	3.00	1.00	-1.00	2.00	1.00	2.00	1.00	2.00
3.00	2.00	1.00	1.00	1.00	-1.00	-2.00	1.00	-3.00	-1.00	2.00	1.00	3.00	0.00	1.00	2.00	3.00	0.00	1.00	2.00
0.02	0.01	0.02	0.03	0.01	0.00	-0.02	0.01	-0.01	-0.01	0.02	0.01	0.03	0.00	0.01	0.03	0.02	0.00	0.01	0.02

ST36	ST37	ST38	ST39	ST40	ST41	ST42	ST43	ST44	ST45	ST46	ST47	ST48	ST49	ST50	ST51	ST52	ST53	ST54	ST55	ST56	ST57	ST58	ST59	ST60
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
2.00	1.00	-1.00	-1.00	-1.00	-1.00	3.00	2.00	-2.00	-2.00	1.00	-1.00	1.00	1.00	3.00	2.00	3.00	2.00	-1.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	1.00	-1.00	-1.00	-1.00	-1.00	1.00	2.00	-2.00	-1.00	0.00	-1.00	1.00	1.00	-1.00	2.00	1.00	2.00	-2.00	-2.00	2.00	2.00	1.00	2.00	-1.00
2.00	1.00	2.00	1.00	0.00	3.00	3.00	2.00	1.00	0.00	1.00	-1.00	1.00	1.00	2.00	1.00	2.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00
-1.00	2.00	1.00	1.00	2.00	-1.00	2.00	1.00	1.00	2.00	1.00	3.00	1.00	-1.00	2.00	1.00	-2.00	1.00	2.00	1.00	0.00	-1.00	2.00	1.00	1.00
1.00	-1.00	1.00	2.00	1.00	2.00	1.00	1.00	-2.00	1.00	-1.00	-2.00	1.00	-2.00	1.00	-1.00	-2.00	1.00	2.00	1.00	1.00	-2.00	-1.00	1.00	-2.00
1.00	2.00	1.00	3.00	3.00	2.00	1.00	1.00	2.00	1.00	2.00	1.00	2.00	3.00	1.00	2.00	1.00	2.00	1.00	3.00	2.00	1.00	2.00	1.00	2.00
3.00	1.00	3.00	3.00	2.00	1.00	0.00	1.00	2.00	3.00	2.00	1.00	0.00	2.00	0.00	2.00	1.00	2.00	3.00	2.00	1.00	1.00	2.00	3.00	1.00
0.03	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.00	0.01	0.02	0.02	0.02	0.01	0.03	0.02	0.02	0.02	0.01	0.03	0.03	0.015

$$PBSP = 1 + \left(\sum_{i=1}^{n} V_i - LV\right) \times \frac{(5-1)}{(HV-LV)}$$	3.59

* Please refer to Figure 5.10, page 124 for details about the parameters used in this analysis.

Appendix G Students' Perceptions towards the Capability of the Admission Component

An illustration of the analysis of the *Admission Component* capability to support the *Admission Service* as it is perceived by 60 students.

			ST1	ST2	ST3	ST4	ST5	ST6	ST7	ST8	ST9	ST10
Number	Criteria	C.W / S.W	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
1	The IT component fits well with the user style or mode	0.05	3.00	2.00	1.00	0.00	3.00	1.00	3.00	1.00	1.00	1.00
2	The IT component enables the user to accomplish relevant task(s) more quickly	0.10	1.00	3.00	-2.00	0.00	3.00	1.00	-2.00	2.00	3.00	2.00
3	The IT component is easy to use	0.15	-1.00	-2.00	-1.00	0.00	3.00	-2.00	1.00	2.00	-1.00	-3.00
4	The IT component ensures equal opportunity for all users	0.15	-1.00	-2.00	-3.00	-1.00	-3.00	-2.00	1.00	0.00	0.00	-3.00
5	The IT component improves communications with other relevant stakeholders	0.01	0.00	0.00	1.00	-1.00	2.00	3.00	-1.00	0.00	0.00	-3.00
6	User's information is kept confidential throughout the use of the IT component	0.10	1.00	0.00	-1.00	0.00	0.00	1.00	0.00	0.00	0.00	-3.00
7	The IT component is compatible with all the aspects of the user's task(s)	0.10	-2.00	0.00	-1.00	0.00	3.00	1.00	0.00	-1.00	2.00	-1.00
8	It becomes more interesting to use the IT component in the execution of relevant task(s)	0.02	-1.00	-3.00	0.00	-1.00	3.00	0.00	1.00	-1.00	-1.00	-3.00
9	It is easy for the user to become more skilful in using the IT component in executing relevant task(s)	0.02	-1.00	1.00	0.00	0.00	3.00	0.00	2.00	1.00	-1.00	2.00
10	The IT component is capable to provide appropriate support when problems arise and need prompt solutions	0.10	-3.00	-2.00	-3.00	-1.00	-3.00	1.00	0.00	-3.00	-3.00	-3.00
11	I'm totally satisfied with the use of this component to support my business activities	0.20	-1.00	1.00	-3.00	-1.00	2.00	1.00	-1.00	-2.00	-2.00	-3.00
	$V_i = \left(\sum_{j=1}^{11} uv_j \times cw_j\right) \times uw_i$		-0.012	-0.004	-0.03	-0.01	0.02	0.00	0.00	0.00	-0.01	-0.03

ST11	ST12	ST13	ST14	ST15	ST16	ST17	ST18	ST19	ST20	ST21	ST22	ST23	ST24	ST25	ST26	ST27	ST28	ST29	ST30
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
2.00	3.00	3.00	2.00	1.00	-2.00	0.00	3.00	3.00	-2.00	0.00	2.00	1.00	2.00	0.00	1.00	1.00	3.00	1.00	2.00
-1.00	-3.00	-1.00	-2.00	-3.00	2.00	-3.00	-2.00	2.00	-1.00	-1.00	-2.00	-1.00	-2.00	2.00	0.00	-2.00	-2.00	-3.00	2.00
-3.00	-3.00	-3.00	-1.00	-1.00	-3.00	-3.00	-2.00	-2.00	-2.00	-1.00	-3.00	-1.00	-2.00	-3.00	-3.00	-3.00	-3.00	-3.00	-1.00
0.00	-3.00	-2.00	2.00	0.00	-3.00	-3.00	-3.00	0.00	-2.00	-2.00	-3.00	-1.00	-3.00	-1.00	-3.00	-3.00	-3.00	-3.00	2.00
0.00	0.00	-1.00	1.00	0.00	2.00	-1.00	1.00	0.00	-2.00	2.00	1.00	-1.00	-3.00	2.00	2.00	0.00	-1.00	1.00	2.00
0.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	-1.00	-3.00	-1.00	1.00	-3.00	2.00	0.00	-1.00	1.00	2.00
-1.00	-1.00	1.00	1.00	1.00	1.00	-1.00	-1.00	1.00	-1.00	1.00	-3.00	-1.00	1.00	-3.00	2.00	-1.00	-1.00	1.00	3.00
-1.00	-3.00	0.00	0.00	-3.00	-1.00	-1.00	-3.00	2.00	-2.00	0.00	-3.00	-3.00	-2.00	-3.00	-3.00	-2.00	-1.00	-3.00	1.00
-1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	3.00	1.00	2.00	0.00	1.00	-1.00	-3.00	0.00	0.00	-1.00	1.00	3.00
-3.00	-3.00	-3.00	-3.00	-3.00	0.00	-1.00	-3.00	-1.00	-2.00	0.00	-3.00	1.00	-2.00	-3.00	-3.00	-3.00	1.00	-3.00	2.00
-1.00	-1.00	1.00	-1.00	-1.00	0.00	-2.00	-2.00	0.00	-2.00	1.00	-3.00	1.00	-2.00	1.00	-3.00	-3.00	1.00	-3.00	3.00
-0.02	-0.03	-0.01	0.00	-0.01	-0.01	-0.03	-0.03	0.00	-0.02	0.00	-0.04	0.00	-0.02	-0.02	-0.02	-0.03	-0.01	-0.03	0.03

ST31	ST32	ST33	ST34	ST35	ST36	ST37	ST38	ST39	ST40	ST41	ST42	ST43	ST44	ST45	ST46	ST47	ST48	ST49	ST50
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
1.00	3.00	1.00	2.00	-2.00	-3.00	1.00	-1.00	-1.00	-1.00	-1.00	3.00	1.00	3.00	-1.00	1.00	-1.00	1.00	-2.00	3.00
-1.00	0.00	1.00	1.00	-2.00	-1.00	1.00	-1.00	-2.00	-1.00	-1.00	2.00	2.00	-1.00	-1.00	1.00	-1.00	1.00	0.00	1.00
1.00	-2.00	1.00	-1.00	-2.00	-3.00	-2.00	-1.00	-2.00	-1.00	-1.00	3.00	0.00	-3.00	-2.00	0.00	-1.00	1.00	-3.00	-1.00
1.00	-2.00	-2.00	0.00	-3.00	-3.00	-1.00	-2.00	-2.00	-2.00	-2.00	1.00	0.00	-3.00	-2.00	-1.00	-2.00	-2.00	-3.00	2.00
-1.00	2.00	-2.00	0.00	-2.00	3.00	-1.00	2.00	1.00	2.00	3.00	0.00	0.00	0.00	2.00	-2.00	3.00	2.00	1.00	2.00
1.00	-2.00	1.00	0.00	-2.00	1.00	-1.00	-2.00	1.00	-2.00	1.00	3.00	0.00	0.00	-1.00	1.00	1.00	1.00	1.00	2.00
-1.00	-3.00	-1.00	-1.00	-2.00	-1.00	1.00	-2.00	-2.00	-1.00	-2.00	1.00	1.00	-2.00	-2.00	1.00	-3.00	-1.00	-1.00	-2.00
-1.00	-2.00	-1.00	-1.00	-2.00	-2.00	-2.00	-2.00	-1.00	-2.00	-2.00	-3.00	1.00	-2.00	-2.00	0.00	-2.00	-1.00	-3.00	-2.00
-1.00	1.00	0.00	-1.00	-1.00	2.00	-2.00	-2.00	-1.00	0.00	1.00	0.00	1.00	-2.00	2.00	0.00	-1.00	-1.00	-3.00	1.00
-1.00	-2.00	-2.00	-2.00	-2.00	0.00	-2.00	-2.00	-3.00	-3.00	-3.00	0.00	0.00	-2.00	-2.00	-3.00	-3.00	-3.00	-3.00	0.00
-1.00	-2.00	-3.00	-2.00	-1.00	0.00	-3.00	-1.00	1.00	-3.00	1.00	0.00	1.00	-3.00	-3.00	-2.00	-2.00	-3.00	-1.00	-2.00
0.00	-0.03	-0.01	-0.01	-0.03	-0.02	-0.02	-0.02	-0.02	-0.03	-0.01	0.02	0.01	-0.03	-0.03	-0.01	-0.03	-0.02	-0.03	0.00

ST51	ST52	ST53	ST54	ST55	ST56	ST57	ST58	ST59	ST60
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
-1.00	1.00	-1.00	0.00	1.00	2.00	2.00	2.00	2.00	2.00
3.00	2.00	3.00	0.00	2.00	1.00	1.00	2.00	-3.00	2.00
-3.00	1.00	-2.00	0.00	-2.00	-2.00	-3.00	-2.00	-2.00	-2.00
-3.00	1.00	-2.00	0.00	-2.00	-2.00	-3.00	-2.00	-3.00	1.00
2.00	1.00	-1.00	0.00	-2.00	1.00	-1.00	2.00	1.00	2.00
3.00	3.00	3.00	0.00	-2.00	-2.00	1.00	1.00	1.00	2.00
-1.00	1.00	-1.00	0.00	-1.00	-1.00	1.00	-1.00	1.00	0.00
-3.00	-1.00	-3.00	-2.00	-1.00	-2.00	-3.00	-3.00	-1.00	1.00
-1.00	1.00	-1.00	0.00	2.00	2.00	0.00	2.00	1.00	0.00
-1.00	1.00	2.00	0.00	-3.00	-3.00	-3.00	-3.00	-3.00	-1.00
1.00	3.00	-3.00	0.00	-1.00	-2.00	-3.00	1.00	-3.00	-1.00
-0.01	0.03	-0.01	0.00	-0.02	-0.02	-0.02	-0.01	-0.03	0.001

$UPV = 1 + \left(\sum_{i=1}^{n} V_i - LV\right) \times \frac{(5-1)}{(HV-LV)}$	2.46

* Please refer to Figure 5.16, page 133 for details about the parameters used in this analysis.

Appendix H The Permission from Albaha University to Conduct the Case Study

The permission granted from Albaha University to carry out the case study along with a confirmation letter indicating the successful completion of the field work from the fieldwork supervisor.

بسم الله الرحمن الرحيم

KINGDOM OF SAUDI ARABIA
MINISTRY OF HIGHER EDUCATION
AL-BAHA UNIVERSITY (042)
Vic Rector Office For
Graduate Studies & Scientific Research

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الباحة (٠٤٢)
مكتب وكيل الجامعة
للدراسات العليا والبحث العلمي

سعادة الملحق الثقافي ببريطانيا حفظه الله

السلام عليكم ورحمة الله وبركاته وبعد:

فأشير إلى الطلب المقدم من الأستاذ/ حسن عبدالله أحمد الغامدي رقم الهوية الوطنية (1051775797) ورقمه في الملحقية (BHU124) المحاضر بكلية علوم الحاسب وتقنية المعلومات بجامعة الباحة والمبتعث لدراسة الدكتوراة بجامعة ريدينق ببريطانيا، بشأن طلب الموافقة على إجراء دراسة ميدانية تتعلق ببحثه للدكتوراه خلال المدة من 18 سبتمبر 2016 م حتى تاريخ 16 ديسمبر 2016 م.

عليه نفيد سعادتكم بموافقة الجامعة على إجراء الدراسة الميدانية فيها والإشراف عليه من قبل أحد المتخصصين في الجامعة عليه طيلة المدة المذكورة أعلاه.

وتقبلوا سعاوتكم خالص التحية والتقدير،،،

وكيل الجامعة
للدراسات العليا والبحث العلمي

أ.د. سعيد بن صالح الرقيب

جامعة الباحة
رقم المعاملة: ٣٧١٢٥٧٣١
تاريخ التحرير: ١٤٣٧/٠٩/٠٨
وقت التحرير: ١٣:٤٥
المرفقات: ٢

الرقم: ..... التاريخ: ..... المشفوعات: .....

تليفون: ٠٠٩٦٦-٧-٧٢٧٤١١١ فاكس: ٠٠٩٦٦-٧-٧٢٤٧٢٧٢ الباحة: ص.ب (١٩٨٨)
Tel.: 00966 7 7274111 fax: 0966 7 7247272 Al-Baha P.O.Box (1988)

KINGDOM OF SAUDI ARABIA
MINISTRY OF HIGHER EDUCATION
AL-BAHA UNIVERSITY (042)

بسم الله الرحمن الرحيم

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الباحة (٠٤٢)

16 December 2016

To Whom It May Concern:

This is to confirm that **Mr. Hassan Abdullah A Alghamdi** has conducted a fieldwork and collected data from Albaha University for his PhD research at the University of Reading, which titled as:

(A Service Driven Method for Evaluating Business and IT Alignment)

The fieldwork started on September 18, 2016 and was completed on December 16, 2016. This letter has been issued upon Mr. Alghamdi request to submit to whom it may concern.

Fieldwork Supervisor

Faculty of Computer Science
and Information Technology

الرقم : ..... التاريخ : ..... المشفوعات : .....

تليفون : ٧٢٧٤١١١ – ٧ – ٠٠٩٦٦ فاكس : ٧٢٤٧٢٧٢ – ٧ – ٠٠٩٦٦ الباحة : ص.ب (١٩٨٨)
Tel.: 00966 7 7274111 fax: 0966 7 7247272 Al-Baha P.O.Box (1988)

Appendix I Candidate's Publications

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