The Department of Information Systems

MCOM INFORMATION MANAGEMENT

FINAL THESIS

THE APPLICATION OF USABILITY PRINCIPLES TO CREATE WEB-BASED APPLICATIONS THAT ACHIEVE INCREASED SYSTEM USAGE

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July 2011

ABSTRACT:

This research work investigates and reports on the contribution of usability and perceptual frameworks towards understanding and ultimately increasing usage of a sales website and a corporate marketing website for a major insurance company in South Africa. It investigates whether the application of usability principles to the sales web positively influences the usage of the sales web system as a tool by intermediaries, and in so doing help the organisation recoup their investment and lower operational costs.

This financial services (traditionally insurance) company, like many organisations, is in the process of migrating key operational systems onto web platforms to take advantage of benefits such as the ubiquity of web access and services orientated architecture among others.

The research reviewed key frameworks in the area of technology acceptance or usage namely
- Nielsen's usability attributes (Nielsen, 2003)
- The Technology Acceptance Model (TAM), (Davis, 1989)
- The Theory of Reasoned Action (Fishbein & Ajzen, 1975)
- The Theory of Planned Behavior (Ajzen, 1985);

and derived a theoretical summative model (the Conceptual Research Model) that combined both usability and perceptual dimensions. The applicability of this summative model was empirically tested using quantitative data relating to system usage and user perception.

Empirical evidence was gathered to prove and refine the Conceptual Research Model (CRM), and the data substantiated the inclusion of the constructs in the CRM, as well as the efficacy of the model in a financial services organisation. Through testing of the CRM, this research has also confirmed which specific attributes of usability can be focussed on to bring about positive change in users' usage behaviour and adoption of a website or web application.
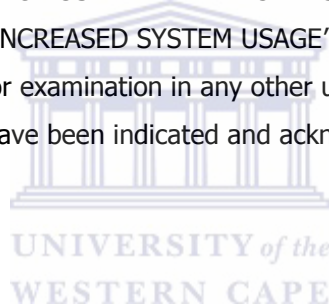
TITLE:

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KEYWORDS:

USABILITY; USER ADOPTION; CONSUMER USAGE BEHAVIOUR; USEFULNESS; EASE-OF-USE; SUBJECTIVE NORM; USER-CENTRED ANALYSIS; USER-CENTRED DESIGN; TECHNOLOGY ACCEPTANCE MODEL (TAM); THEORY OF REASONED ACTION (TRA); THEORY OF PLANNED BEHAVIOUR (TPB)

DECLARATION:

I declare that 'THE APPLICATION OF USABILITY PRINCIPLES TO CREATE WEB-BASED APPLICATIONS THAT ACHIEVE INCREASED SYSTEM USAGE' is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Name: Stephanie C. Bezuidenhout

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Chapter 1: INTRODUCTION

BACKGROUND TO RESEARCH PROBLEM

Globally, the financial services industry has become commoditised, and products and services, and even cost are no longer enough to differentiate an organisation from its competitors. Since the introduction of Web 2.0 into the ICT landscape, there has been an accelerated trend towards development of web applications to support key operational processes within organisations, as opposed to these organisations having to distribute or rollout thick client applications to provide software and functionality to their clients and partners to support business processes.

These applications offer many advantages such as, accessibility due to the ubiquity of web browsers, compatibility as most users will support a recognisable browser and not least, centralised maintenance as potentially hundreds of client platforms no longer have to support the application software. Typically, business applications are written or tailored for a specific organisation, and once implemented, use of these applications is usually mandatory. However, applications written for the web generally operate in a competitive market place where users are 'one-click' away from going to a competitor site (Nielsen, 2003). Website users have become accustomed to this level of freedom and choice when browsing the Internet; the new variable in the mix is the element of compulsion introduced by organisations using web applications for operational processes, since their processes can only be effective if their clients or staff use their applications.

This research work is based on an organisation that has a corporate site for use by the public (existing and potential clients), internal users (staff), external staff (intermediaries) and their Investor Relations audience – analysts, shareholders, media, researchers and students. The organisation recently re-launched their corporate website after having redesigned it according to usability principles, in order to ensure that:

- The new site is more user-centric and is structured according to the users' mental model, in support of the organisation's strategic objective of client centricity
- Users are able to successfully achieve the tasks that they wish to carry out on the site to their satisfaction
- The organisation's products and solutions are presented according to the user's needs and not according to the organisation's internal structure
- Online and offline marketing is aligned, so that what clients see/experience offline in the media and in print brochures gives them something to recognise when they browse online – that the site reflects the brand

- The Group is positioned as a financial services group rather than a life insurance company, and that separate business units or businesses within the Group are reflected more cohesively

Usability principles were implemented through a process of User-centred analysis and User-Centred design aimed at understanding who the users are, what they need, and how they carry out tasks, and then designing to match the user's mental model to improve efficiency, effectiveness and satisfaction. The sales force represents the organisation in their interactions with clients, and it is therefore that much more critical that they are enabled with all the tools required for effective and efficient servicing of clients. The intermediaries (sales force) have access to the sales web, where they can retrieve information regarding their contracts, commission accounts, sales leads, their clients and related documentation. They are also able to access various transactions in order to provide quotations and other information to their clients.

The current structure of information and presentation of content of the sales web is not as effective as it should be. The Information Architecture is structured ineffectively, making it difficult for the intermediaries to navigate successfully to product and other information necessary to service their clients. The Information Architecture of a system refers to the structure, grouping, labelling and layout of information or content within a website or application. It is a fundamental part of usability and done effectively, can ensure that your users are able to find the information they require, and complete the tasks they need to carry out as quickly and easily as possible. Therefore, in order to address the usability of the sales web, the architecture of the information needed to be addressed in order to make using the website as intuitive as possible for the intermediaries.

Time is a valuable commodity to the intermediaries, and if they – and the organisation – were to be successful, then as much of their time as possible needs to be aimed at activities that effectively contribute towards writing or completing sales business for the organisation.

Due to the negative impact that an ineffective and non-usable sales web had on productivity, the intermediaries were more likely to contact the organisation's Call Centre to provide quotations and other client information, than they were to access the same transactions themselves via the self-help facilities that were made available on the sales web in order to lower operational costs. At the time, two-thirds of the volume for these transactions was handled via the organisation's Call Centre, leading to higher costs for the organisation since additional agents were required to service these intermediaries. Servicing these transactions had a huge impact on operational costs – amounting to millions of Rands per annum to cover traffic that was processed via the Call Centre, rather than the sales web.

This organisation has struggled with the problem of how to increase usage of the website by intermediaries in order to manage their operational costs more effectively.

This research work was carried out in 2 phases to try and address the question of whether applying usability principles could help the organisation in designing a website that was more usable and whether this would lead to increased usage of the website by intermediaries.

Phase 1 Research

The first phase of this research was conducted as part of an honours programme of study – published in the conference paper Whyte & Bezuidenhout (2010), - and aimed to confirm whether the users' perceptions of the problems experienced by them when using the website related to the lack of usability, and whether they perceived this to be the reason for their low usage. It also aimed to confirm the application of usability principles as a predictor for increased usage of the sales web, and to answer the question: Is an effective and usable web site/application enough to ensure that it is used by your target audience? The research identified Davis' Technology Acceptance Model (TAM) (Davis et al, 1989) which shows that it is the user's perception of usability, as opposed to usability, that has a direct link to actual usage.

From the research of various models for system usage and usage behaviour, a conceptual model (called the Conceptual Research Model (CRM) and discussed later in this thesis) was defined for the application of usability and increased usage of the sales web and corporate site, with application aimed at web applications in general.

The first phase of the research tested users' perceptions of the constructs Usefulness and Ease-of-use (according to Davis' TAM model and the Conceptual Research Model that was developed for this study) and combined this with the construct Subjective Norm – from the Theory of Reasoned Action (TRA), (Fishbein & Ajzen, 1975 and Ajzen & Fishbein, 1980) and the Theory of Planned Behaviour (Ajzen, 1985, 1991). The Conceptual Research Model proposes that these three constructs are the predictors for system usage and adds the Application of usability as an antecedent construct. Anecdotal evidence from users of the sales web (collected during the first phase) confirmed the following usability issues needed to be addressed in order to increase usefulness and ease-of-use, and ultimately usage of the sales web:

- More intuitive structure of information
- Highlighting of important content – layout
- Easier/quicker access to frequently used transactions/content
- Access to training material to enable awareness and more efficient use of functionality available

- Communication of tools and other pertinent information to increase productivity and sales

In addition, users also confirmed that Management needed to demonstrate their commitment to the sales web as a sales tool more vigorously, through addressing the usability issues above and increased marketing and communication efforts, thereby lending some support for the inclusion of subjective norm in the Conceptual Research Model (CRM). While the full-scale redesign of the sales web had been postponed due to budgetary constraints, a more piecemeal approach was later implemented for prioritised pages/sections that had been highlighted as critical.

Since the completion of the previous research, some redesign work was done in terms of the top 6 transactions, where only a third of the intermediary usage of these transactions was via the sales web. Since these transactions were so critical in the intermediaries' work, this study also aimed to confirm what impact an improved perception of the usability of these transactions could have on overall perceptions of ease-of-use and usefulness of the site?

The intention of the second phase of the research was to extend the previous work. The second phase aimed to discover whether usability remained as powerful even when only applied to certain specific parts of a web application. Did this targeted application of usability still have a positive impact on overall usage, and maybe even play a part in demonstrating management commitment and their endorsement of usage over time? (subjective norm).

The application of usability principles was intended to take the organisation one step closer in their mission to become more client-centric, and to create a more positive experience for the client during their interactions with the organisation, including when intermediated.

The corporate site redesign's completion coinciding with the second phase of the research also provided the opportunity to test the Conceptual Research Model (CRM) for system usage on another web site with a different audience.

STATEMENT OF THE RESEARCH PROBLEM

Organisations often invest huge amounts of capital to build web (and other) applications, but these applications are often not used to their full potential, or not used at all. Organisations are therefore realising limited return on their investments, and users are less effective and efficient than they could be.

In particular, the studied organisation had invested capital in building the sales website for the purpose of enabling intermediaries to carry out processes/transactions themselves without the help of a Call Centre agent. This was done to minimise the cost and volume of these transactions being carried out by Call Centre agents, and the delay for the intermediary in waiting for the Call Centre to provide the output.

The problem experienced in the studied organisation was insufficient usage/adoption of the sales website, which not only impacted on the efficiency of the work of the intermediaries, but also limited the intended benefit of this work in terms of lowering operational costs.

RESEARCH QUESTION

Phase 1 of this research investigated models that explain what impacts technology adoption and usage behaviour, and determined a Conceptual Research Model (CRM) that combined constructs from these models to understand which principles organisations needed to apply in designing their web applications to ensure usage and ultimately return on their investments.

The main question therefore posed by this research is: How effective is the Conceptual Research Model (as a measure of web application usability) in predicting usage behaviour?

RESEARCH SUB-QUESTIONS

- Is there evidence to support the inclusion of the application of usability principles as an antecedent to Perception of Ease-of-Use and Perception of Usefulness?
- Does optionality impact on the predictability of the Conceptual Research Model (CRM), particularly in the organisational context?
- Does the CRM give us greater understanding of usage behaviour in terms of actual usage as well as the user's perception of usage?
- First phase of the research provided minimal support for the inclusion of subjective norm, but evidence seems to point to unit of analysis (web application as a whole) as impacting this. Will specific functions/modules/transactions within the web application as unit of analysis have an impact on inclusion of subjective norm?

- The Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) suggest subjective norm impacts Attitude. Does subjective norm also impact usage behaviour through Perception of Usefulness?

RESEARCH OBJECTIVES

The objectives of this research were:

- To test and validate the Conceptual Research Model (CRM) in order to determine the effectiveness and usefulness of the CRM in predicting usage behaviour;

- To assess CRM against the publishedliterature in order to prepare it for further empirical testing;

- To test the refined CRM in a setting of a financial services institution;

- To possibly refine and modify the empirically tested CRM in order to offer it as a (possible) solution to other similar organisations facing similar problems;

- To present the CRM to the academic community as a possible teaching model;

- Many models have proposed constructs that impact usage, but do not give organisations clear guidelines on practical actions that they can carry out in order to achieve these constructs positively within their organisations, this research proposed to offer some practical suggestions;

- To understand and validate what organisations needed to do in order to ensure that usage of key operational systems is frequent, continued and integrated into users' ongoing routines.

DELINEATION OF THE RESEARCH

The scope of this research was limited to an organisation in the financial services industry. The systems included in the empirical testing are the sales web application used by the organisation's intermediaries, and the public website available to all existing and potential clients to consume information regarding all facets of doing business with the organisation.

Special interest was given to the user-centred design process applied to these web applications, specifically the usability principles, in order to determine the impact of the application of these principles on user behaviour.

Refer to Appendix 1 for the Entity Relationship Model indicating the scope of the research area, detailing the entities that were covered by the research, as well as the relationships between these entities.
The model indicates all the interacting entities, while the shaded area indicates the immediate boundary of the research to be carried out.

Chapter 2: LITERATURE REVIEW

Websites have traditionally been a channel, provided by organisations, that people go to for information, and later, with the advent of e-commerce, have become a vehicle for trading for certain people. But, if a user cannot find content or finds the site difficult to use, or dislikes it for whatever reason, they will abandon the site and go elsewhere.

In particular, the various businesses in the studied organisation are more frequently using web applications to deliver key operational outputs to their clients, intermediaries and business partners. How much more critical is it not, to ensure that these systems are used, and that they deliver these key services in a way that is effective, efficient and usable?

What makes a web site usable? And is an effective and usable site enough to ensure that it is used by your target audience?

WHAT IS USABILITY?

Usability has evolved from principles and techniques of various disciplines – human-computer interaction, as a quality concept in the field of ergonomics/human factors[1], perceptual and cognitive psychology, computer science, social psychology and marketing, amongst others (Schaffer, 2008 & Myers et al, 1996).

According to the ISO 9241 (1996) standard, usability is defined as "the extent to which a product can be used by specified users to achieve specified outcomes within a specified context of use". ISO 9241 (1997) further refers to effectiveness, efficiency and satisfaction.

Nielsen (2003) defines usability as a quality attribute that evaluates how easy a user interface is to use, and also refers to the methods for enhancing ease-of-use during the design process. Nielsen (2003) states that usability is defined by 5 quality components or usability attributes:

- Learnability
- Efficiency
- Memorability
- Ease of recovery from errors
- Satisfaction

Schaffer & Weinschenk, authors of the only ISO-certified user-centred design methodology, have an additional usability attribute:

- Effectiveness (Schaffer & Weinschenk, Schaffer, 2004)

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[1] Science of design based on human needs. Studies relating to human capabilities in relation to their work demands
- http://www.ergonomics.org/ (Accessed 03/12/2008)

Nielsen (2003) further states that in the case of an extranet, such as the sales web, usability is a matter of employee productivity.

While there is ample literature to support the theory that the correct application of usability principles will ensure that the sales web enables the users to carry out critical business functions effectively and with ease (Nielsen, 1993; Hilbert & Redmiles, 2000; Shiri & Revie, 2005; Ormsby, 2008), how do we ensure that the sales force will use the sales web? How do we break the current and past patterns of non-usage?

None of the current definitions of usability make an explicit link to system usage.

This research investigated what models were available in defining usage behaviour in order to identify what factors or constructs were defined in each model as impacting usage behaviour. The research aimed to also understand what principles organisations could apply to influence usage behaviour and whether the principles of usability could be included in a new model to extend the existing research into technology adoption or usage.

From Davis' Technology Adoption Model (Davis, 1989), a widely accepted model and powerful predictor for technology adoption, user perception of usability, as opposed to usability, is shown to have a direct link to actual usage.

According to Grudin (1992) usability and utility are subcategories of the more general term "usefulness". Utility is whether the system can support the needs of the users, while Usability is how satisfactorily users can make use of the functionality. Dzida (1996) confirms this view.

While these definitions do not correlate totally to the more accepted definitions of Nielsen (2003) and Schaffer (2004), who do not explicitly link usability to usage, Grudin indirectly corroborates Davis' TAM model in that usability (specifically the satisfaction attribute defined by Schaffer & Nielsen) influences usage behaviour through positive user perception.

So, how do we ensure that our target audience will use our websites or web applications? And that their perception of the sites/applications will be one of effectiveness, efficiency and ease-of-use?

THEORY OF REASONED ACTION (TRA):
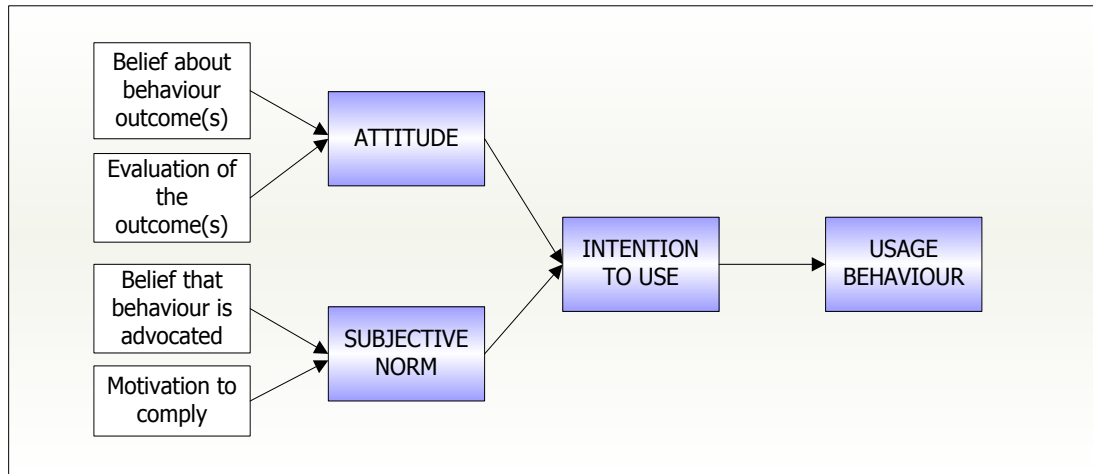
Figure 1: Representation of Theory of Reasoned Action (TRA)

Derived from a social psychology setting, the Theory of Reasoned Action states that individual's beliefs and attitudes largely explain most human behaviours.

The theory asserts that an individual's intention to perform a behaviour is determined by:

- Attitude (positive or negative) towards the behaviour – essentially stems from user beliefs regarding the likely outcome(s) of a behaviour, and evaluation of these outcomes
- Subjective norm – an individual's perception of other people's opinions about performing the behaviour, and their motivation to comply with these opinions – i.e. the social influence determinant of intention (Fishbein & Ajzen, 1975 and Ajzen & Fishbein, 1980).

THEORY OF PLANNED BEHAVIOUR (TPB):
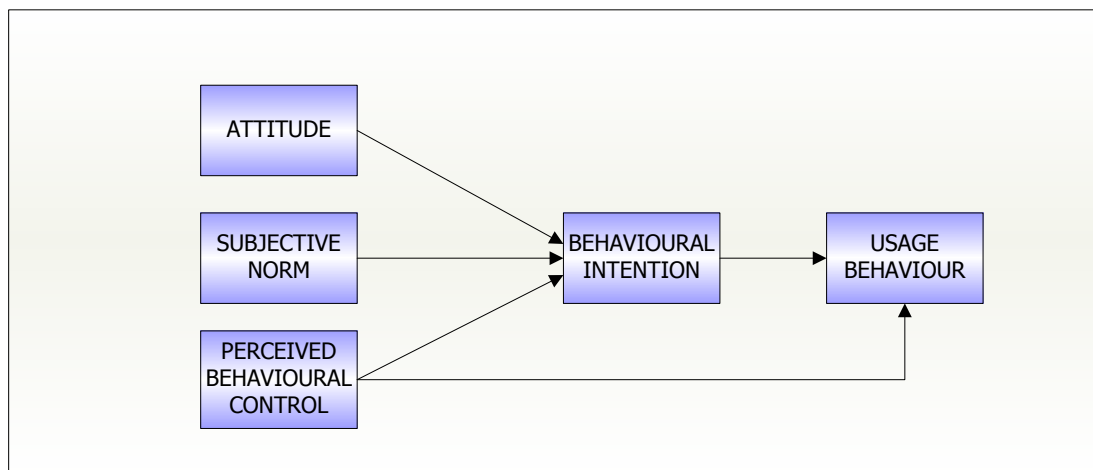
Figure 2: Theory of Planned Behaviour (TPB)

TRA was later revised and extended by Ajzen himself into the Theory of Planned Behaviour (1985, 1991) which states that users' intention to perform an activity is determined by:

- Attitude

- Perceived behavioural control – the user's perception of how easy or difficult a behaviour is to perform (this predictor forms the extension to the TRA)
- Subjective norm

Perceived behavioural control relates to one's conviction that you are able to successfully execute the behaviour to achieve the outcome. A lack of conviction can negatively impact the user's intentions and usage behaviour.

TECHNOLOGY ACCEPTANCE MODEL (TAM):
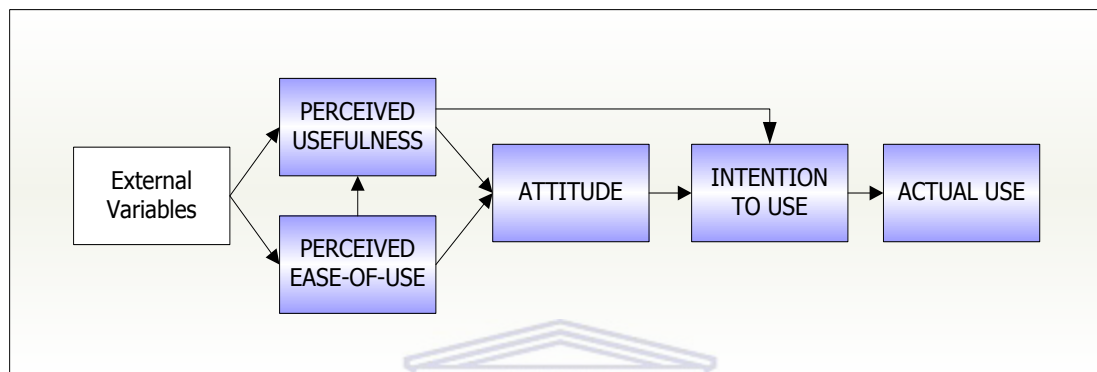
Figure 3: Original Technology Acceptance Model (TAM) - Davis et al, 1989.

The Technology Acceptance Model (TAM) (Davis, 1989), adapted from the Theory of Reasoned Action (Ajzen & Fishbein, 1975, 1980), identifies the factors contributing to the extent to which users will adopt or use a technology or application. It was originally developed to predict users' acceptance of computer technology in the workplace.

As shown in Figure 3, certain beliefs about the technology held by the user will lead to a particular attitude towards the technology or usage thereof. This leads to an intention to use, that then links to actual usage behaviour.

This model includes the common factors/constructs from TRA and TPB, but also extends this thinking to provide the constructs that impact the user's attitude, and therefore ultimately usage behaviour.

Davis' TAM model states that behavioural intention derives from two beliefs:
- Perceived usefulness – defined as the expectation that the technology will enhance one's job performance
- Perceived ease of use – defined as the belief that use of the technology will be free of effort

The TAM model argues that by understanding the users' perceptions of ease of use and usefulness, one can predict the acceptance of a new technology / application (Davis, 1989; Fusilier & Durlabhji, 2005; McKechnie et al, 2006; Chin et al, 2008).

The construct Perceived Behavioural Control (from the Theory of Planned Behaviour), from its definition, ties in with one of the primary constructs of TAM – Perceived Ease of use.

NIELSEN'S FRAMEWORK FOR EFFECTIVE WEB APPLICATIONS:

Nielsen's framework (1993; 1995) while not completely aligned with the previous models discussed here, have certain key concepts in common with TAM, TRA and TPB. Nielsen's framework highlights the importance of constructs, both social and in terms of system practicality.

- Social acceptability – whether the interface is acceptable to users in the context of their society's culture
- Practical acceptability – considers factors such as cost, reliability, compatibility, as well as the Usefulness of the system/interface.

Usefulness has been defined by Nielsen as whether the system can achieve its goal, and usefulness is further divided into utility(functionality) and usability

This framework reinforces the need for practitioners to take into account both practical and social considerations when aiming to build a web application that is effective, and that will ultimately achieve the intended or required return on investment and usage. It also highlights the importance of usefulness as a construct and expands this construct to include usability (with certain usability aspects identified).

As to the relevance to this research, this model confirms the efficacy of models that take into account both social or perceptual dimensions as well as the more concrete and practical aspects of designing an effective and usable web application.
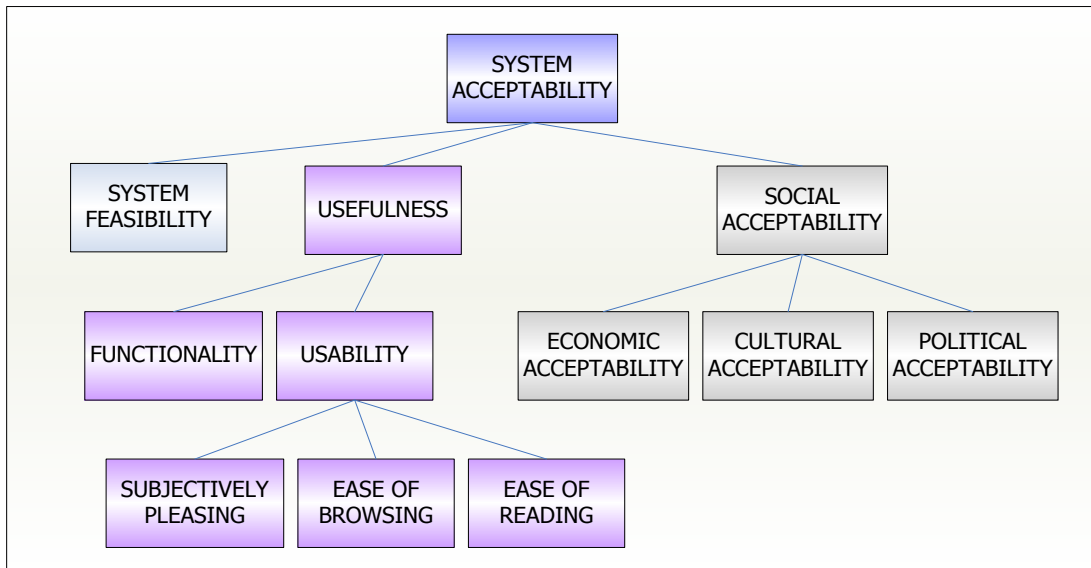
Figure 4: Nielsen's Framework for effective Web application development

CONCEPTUAL RESEARCH MODEL:

The Conceptual Research Model (CRM), a theoretical summative model, combining usability and perceptual aspects of the above models, has been developed for this research. The model used TAM as its basis (due to its proven efficacy in various empirical research studies and) and extended TAM to include Subjective Norm from TRA and TPB.

Further, this research posits that the application of usability principles to web applications can have a fundamental impact on the adoption and usage behaviour of these web applications.

Therefore, usability has been added to this model as a posited antecedent to the perceptions of Ease of use and Usefulness proposed by TAM as instrumental in ultimately determining positive usage behaviour and technology adoption.
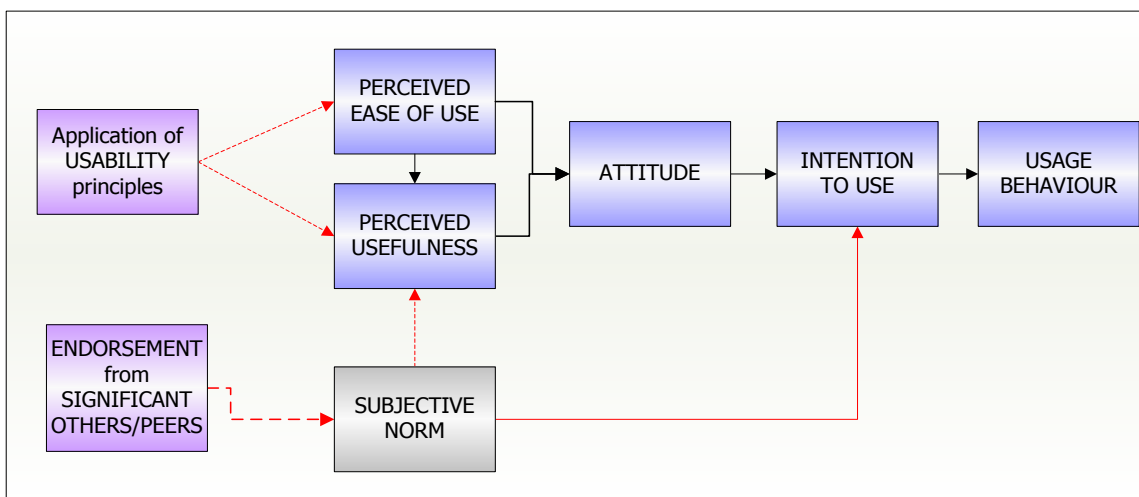
Figure 5: Conceptual Research model (CRM)

The following sections cover some of the literature support that exists for inclusion of each of the constructs in the Conceptual Research Model.

TAM CONSTRUCTS:

The Conceptual Research model (CRM) uses TAM research and constructs (the aspects that make up the TAM model) as its basis because of its proven explanatory properties for this type of research - evidenced by its use in research having been cited in over 450 journal articles up to January 2003 (Burton-Jones & Hubona, 2005).

Numerous empirical studies have also validated the relationship between the TAM constructs and acceptance of web related technology (Chin & Todd, 1995; Venkatesh & Davis, 1995; Szajna, 1996; Lu et al, 2003; Pavlou, 2003; Cheng et al, 2006; Lin & Chou, 2009) making TAM even more suitable for this research into acceptance/usage of this organisation's websites.

Widespread empirical research around TAM shows its suitability not only to predict adoption, but also to diagnose the reasons for lack of acceptance or minimal usage, so that organisations can formulate plans to improve user acceptance (Davis, 1989; Baron et al, 2006; Lin & Chou, 2009). This was precisely what was required to understand and intervene in terms of the websites and web applications of the organisation being researched.

USABILITY:

The application of usability principles and the user-centred processes are specifically geared toward ensuring that your website or application is easy to use, and that users are effective in carrying out the necessary tasks intuitively, efficiently and with satisfaction. There is ample support for the application of usability to ensure efficient, effective usage of your website to carry out functions with ease (Nielsen, 1993; Hilbert & Redmiles, 2000; Ormsby, 2008).

The application of usability addresses ease of use, efficiency and other quality attributes in websites or web applications, and this is documented widely in the research (Nielsen 1993, 2003; Schaffer 2004). So, by making the site more usable, we should ensure positive user perceptions of usability (usefulness and ease-of-use), and therefore usage, according to TAM.

Davis (1989) argued that research on how usefulness and ease-of-use can be influenced by controllable external factors is vital – functional and interface characteristics (Benbasat & Dexter, 1986; Bewley et al, 1983; Dickson et al, 1986), development methodologies (Alavi,

1984), training and education (Nelson & Cheney, 1987) and user involvement in design (Baroudi et al, 1986; Franz & Robey, 1986).

All of these aspects are addressed, and are indeed core to the usability principles applied through user-centred analysis and design methodologies, such as the ISO-certified Schaffer-Weinschenk method (Schaffer & Weinschenk, 2004).

From research around quality models for web applications, Day (1997) argues the quality of a website is focussed and led by the customer, and proposes a process that aligns well, in principle, with the application of the user-centred design processes of usability (Lu & Yeung, 1998).

Usability addresses many of the factors that Day (1997) identified as part of ensuring website quality, and also corresponds with criteria Hatzimanikatis et al (1995) defined in their software quality model.

Regardless of differences in constructs and relationships posited, there is common thinking in the various theories – TAM, TRA and TPB – in that an individual's perceptions of IT have a significant influence on usage behaviour (Agarwal & Karahanna, 2000).

It has been widely researched and validated (through the various TAM-related research studies mentioned above) that perceptions of ease-of-use and usefulness are accepted antecedents and predictors of usage through attitude and behavioural intentions.

PERCEIVED EASE OF USE (PEOU):

The first phase of this research found that while perceptions of usefulness (PU) and ease-of-use (PEOU) were positive, there were detail aspects within the ease-of-use construct specifically that were rated much more negatively. This appears to have quite an impact on actual usage of the system, since the expected usage based on overall PEOU and PU is not being realised.

It has been shown that individuals are more likely to use a system if they perceive that relatively little mental effort will be required in the interaction (Adams et al, 1992). According to Davis (1989), perception of ease represents an "intrinsically motivating aspect of human-computer interactions".

Davis argues that Perceived ease-of-use influences behavioural intentions to use in 2 respects:
- its direct effect on intentions; and

- indirectly through perceived usefulness. Essentially, this means that a technology will be perceived as more useful if easy to use, or easier to use than similarly useful technologies (Davis et al, 1989).

Several empirical studies have confirmed the significance of PEOU and PU in predicting intentions and usage (Agarwal & Prasad, 1999; Venkatesh, 2000; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000).

PERCEIVED USEFULNESS (PU):

Various studies have also highlighted perceived usefulness as a significant predictor of attitude and intentions both before implementation, after a short period of exposure, and months after implementation and initial usage (Davis et al, 1989; Mathieson, 1991; Adams et al, 1992; Szajna, 1996).

Davis argues that perceived usefulness as a construct has strong theoretical foundations for its inclusion as a significant predictor of usage, from various research streams: self-efficacy theory, cost-benefit paradigm, adoption of innovation research. Its significance has been found to derive from the user's belief in a use-performance relationship ie. the belief that usage of the system will improve one's work performance (Davis et al, 1989; Agarwal & Karahanna, 2000).

There is plenty of evidence indicating that TAM is a powerful predictor of users' technology acceptance, and has been extensively used is this regard (Legris et al, 2003; Lu et al, 2003; Han, 2003; McKechnie et al, 2006; Chin et al, 2008). This again substantiates the use of the TAM model and constructs as basis for the conceptual research model.

But, many other models have argued, and showed, the importance of certain specific social influences that can also directly or indirectly impact usage behaviour, and this needs to be taken into account to ensure current patterns of non-usage are broken (Slocombe, 1999).

SUBJECTIVE NORM:

In terms of Subjective Norm, while users/respondents in the first phase of the research appear to be indifferent to their peers' usage, they reported a definite need for management to demonstrate their commitment more seriously by addressing the usability issues being experienced on the sales web, as well as communicating the benefits of the system in terms of their performance more vigorously (Whyte & Bezuidenhout, 2010).

A study by Schillewaert et al (2005) shows that salespeople's perceptions of a technology enhancing their performance, and management's efforts to provide training impact the adoption of a technology.

The first phase data reinforced this in that users expressed the need for initial, ongoing and easily accessible training to both new and existing financial advisers. Igbaria (1990), Thompson et al (1991) and Venkatesh (1999) all agree that training users to effectively apply information technology for specific work scenarios is a major prerequisite for usage.

In this phase of the research, we intended to gain a better understanding of user's perceptions of technology in relation to their work performance, and their beliefs about what management should be doing to improve usage of the sales web. Various studies have argued for the inclusion of social norms to extend models for usage (Sanchez-Franco & Roldan, 2005).

We also hoped to learn whether subjective norm influences usage when optionality is applicable – as in the case of the voluntary use of the corporate website by public users, as well as usage of the sales web, where other channels to get the information are available, and a degree of optionality is therefore relevant.
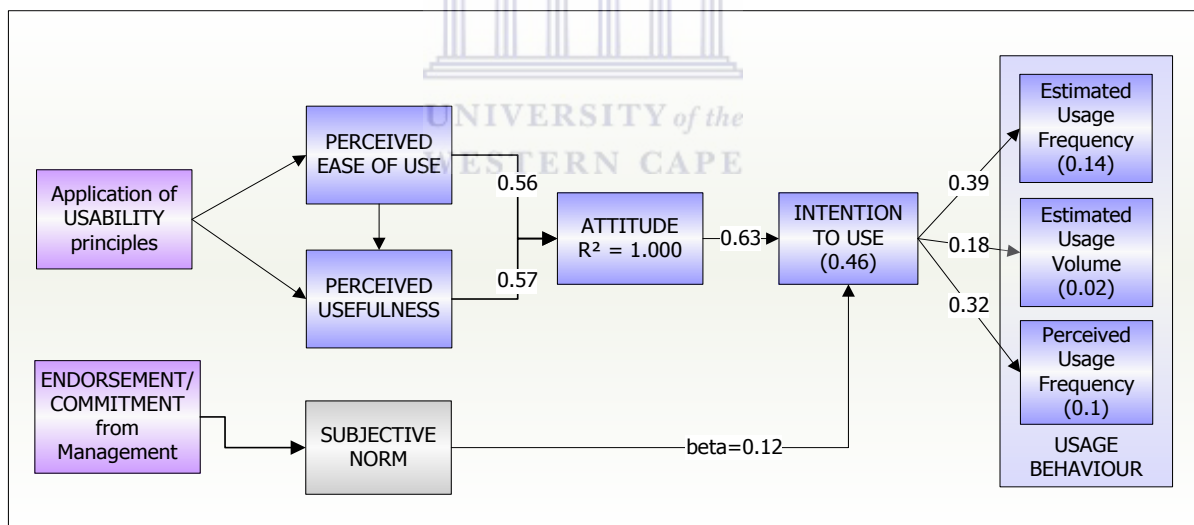
Figure 6: CRM with first phase research results (Whyte & Bezuidenhout, 2010)

Many models have proposed constructs that impact usage, but do not give organisations clear guidelines on practical actions that they can carry out in order to achieve these constructs positively within their organisations in order to bring about the desired outcome.

This research aimed to understand and validate what organisations need to do in order to ensure that usage of key operational systems is frequent, continued and integrated into users' ongoing routines.

Chapter 3: RESEARCH METHODOLOGY

Research philosophy introduces two main methodologies: Qualitative and Quantitative (Welman & Kruger, 2001). The traditional view of what seperates qualitative and quantitative research approaches are as follows:

- Qualitative enquiry examines narratives. It is a process of inductive reasoning that aims to build theories from the examination of specific instances to establish generalisations.
- Quantitative research examines numbers. It is a deductive process that aims primarily to test theories or generalisations and their applicability to specific instances (Hyde, 2000).

In the overwhelming majority of TAM-related or similar research, quantitative research methods have been applied. Davis (1989) developed research instruments for his TAM research (later refined by Davis & Venkatesh, 2000) and these instruments have been widely used in varying industries and applied to various information technologies in the years since by researchers aiming to validate, reapply or extend TAM research.

Since the data that was collected for this research could be classified into predetermined response categories and the most effective and feasible method of collection had been confirmed from the previous phase of the research to be survey-based, we reused this method in the second phase of the research in order to simplify the process of comparing data across research phases.

A standardised instrument and measurement, such as the TAM instrument, allowed for conversion of data into numbers and analysis by means of statistical procedures, thereby increasing the reliability of the observation, facilitating replication studies and allowing generalisation to a larger population (UWC – PET series, 2010).

Based on this evidence of the efficacy and applicability of the quantitative method in previous TAM research, the research methodology chosen for this research is QUANTITATIVE research methodology.

RESEARCH – MAIN HYPOTHESIS

The questions posed in this research are restated as null hypotheses to be tested through the collection and analysis of data. The null hypothesis typically proposes a general or default position, and states that there is no relationship between two particular phenomena, or that a potential action has no effect (Shuttleworth, 2008).

The data collected during this research was analysed, and based on the survey results, the null hypothesis accepted as correct, or rejected as incorrect.

H0 – There is no evidence to suggest that the Conceptual Research Model is a significant predictor of usage behaviour

RESEARCH SUB-HYPOTHESES

H1 – There is no evidence to support the inclusion of the application of usability principles as an antecedent to Perception of Ease-of-Use and Perception of Usefulness

H2 – Optionality does not impact on the predictability of the Conceptual Research Model (CRM), particularly in the organisational context

H3 – The CRM does not provide us with greater understanding of usage behaviour in terms of actual usage as well as the user's perception of usage

H4 – Using specific functions/modules as units of analyses will have no impact on the inclusion of subjective norm

H5 – Subjective norm will have no impact on usage behaviour through Perception of Usefulness

INSTRUMENTS:

Online questionnaire #1: SALES WEB

To test perceptions of ease-of-use and usefulness, the original 10-item TAM instruments developed by Davis (1989), Davis (1993) and used by Venkatesh & Davis (2000), were used.

To measure the construct subjective norm, a slight adaptation of the scale used by Venkatesh & Davis (2000) was used.

Davis (1989) also developed the usage frequency one-item scale using the 6-position categorical boxes to determine users' self-reported usage.

Online questionnaire #2: CORPORATE SITE

Specific attributes of usability (as defined by Nielsen) will be tested in conjunction with other constructs from the CRM.

The correlations between the constructs perceived usefulness, perceived ease-of-use and subjective norm and intention and usage need to be more rigorously tested. In the previous research, (Whyte & Bezuidenhout, 2010) self-reported usage was used as a proxy for usage behaviour. In this research, the research needed to be extended to understand the correlation between self-reported usage (users' perceptions of usage) and actual usage (web analytics).

While understanding how users perceive their usage is relevant and important, specifically in respect of the processes of user-centred analysis and –design, evidence for relative efficacy of the CRM needed to be based on actual usage.

Note: Refer Appendix 2 for Instrument design of each of the questionnaires detailing questions and answer options.

UNIT OF ANALYSIS:

The first phase of the research measured the entire sales web as a unit of analysis. The findings indicated that this limited the understanding of users' perceptions and the impact on usage, since users were using only a small part of the site.

During the second phase of research, which is reported here, transactions or web pages were used as a unit of analysis to enable more specific and widespread testing/results. Specific web pages of the corporate site were included to test the robustness of the model with different functionality and different target users.

SALES WEB

Users of the Sales web instances were included in the sample.
The top 6 transactions of the self-help transactions, where some usability principles had been applied, was the focus of this questionnaire.

Previous research (Whyte & Bezuidenhout, 2010) tested the model constructs with the Sales web as a whole. These results were compared to test whether results with a deeper-level unit of analysis corroborated previous results, or further explain some of the unexpected, or as yet unexplained results from the previous research.

CORPORATE PUBLIC WEBSITE

Specific usability attributes as well as other constructs of the Conceptual Research Model (CRM) were tested on a specific site area – the Careers section of the corporate site – to test users' perceptions and attitudes towards the website and their usage thereof, since the application of usability principles.
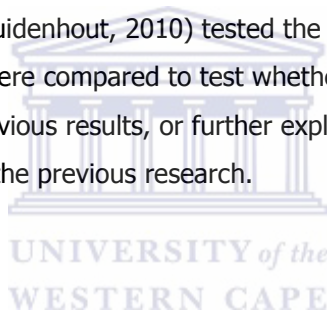
RESEARCH INSTRUMENT DESIGN

Online Questionnaire – Intermediaries (Instrument: email with hyperlink to online questionnaire)

An online questionnaire was chosen to provide easy access to participant users, a convenient method for completing and returning the questionnaire, and to cater for a larger number of intermediaries to be reached most efficiently.

This questionnaire was structured and undisguised, with the exception of a few unstructured (open-ended) questions to allow respondents to give any other feedback or thoughts they wished to contribute to this research.

The questionnaire gathered data on:

- Perception of ease of use

- Perception of usefulness

- Self-reported usage; users' perceptions of usage

- Reported issues that inhibit use of the sales web

- Measures that users feel will promote usage of the sales web

- Whether improvements in usability (specific attributes of usability as defined) have impacted perceptions of Ease-of-use and Usefulness

- Whether optionality plays any role in influencing intention to use or usage behaviour in the organisational context

- Management's role/impact on subjective norm, perception of usefulness, influencing attitude and intentions

The top 6 transactions were made more usable, easy to find, and additional helpful information about using the transaction was made available to users. Did users have a more positive perception of ease-of-use and usefulness as a result of these efforts? (Usability)

We hoped to find out whether any generalisations could be made about their current and future use? Did users intend to use the site more – and more of it – if usability were to be applied to more of the site? (Intentions)

This research also aimed to understand whether/how voluntariness of use impacted users' perceptions, intentions or behaviour. If there were other methods/channels available to get the same information, did users prefer to use the alternatives? (Optionality)

The research intended to have users report on their perception of usage with respect to functionality available on the sales web. We hoped that asking them to rate how much of the functionality they thought they used, would provide us with a more accurate reflection of their perception of their usage.

Online Questionnaire – Public users (Instrument: hyperlink/pop-up to online questionnaire on the organisation's corporate public website)

An online questionnaire was used to collect data in respect of user perceptions, centering around their perceptions of the website as well as their own usage. Data collected before and after the application of usability was compared to determine the impact of usability on usage behaviour.

Specific constructs that make up the Conceptual Research Model (CRM) were tested:

- Usability attributes – learnability, memorability, efficiency, satisfaction
- perceptions of ease-of-use and usefulness
- intention to use
- usage perceptions and behaviour

Archival data – Web analytics

Quantitative data was compared to archival data (web analytics) to learn how perceptions of usage align with users' actual usage.

Web analytics provided data to determine current and past patterns in terms of user behaviour, usage patterns and volumes of critical business transactions. Web analytics was used to confirm or corroborate changes in usage patterns around the time of application of usability efforts to determine what impact, if any, the application of usability had on users' usage behaviour.

This data provided another view of our users in that a record of what users actually do, as opposed to what users reported in the data collected from the questionnaire, could be used to possibly substantiate or refute what users say they do.

Chapter 4: FINDINGS – PRESENTATION OF RESULTS

Data for the model from both questionnaires was analysed using correlation testing and linear multiple regression analysis and the results from the questionnaires collated and compared. These methods correspond with the methods employed in other TAM-related studies and their analysis of the data collected by means of the TAM instruments.

Linear multiple regression analysis involves estimating the coefficients (*beta*) of one or more independent variables to predict (R^2) the value of a single dependent variable. Variables are systematically entered and removed from the equation to determine the line of best fit.

ONLINE QUESTIONNAIRE – SALES WEB

The perception-based online questionnaire was sent out to the entire financial adviser pool,- as the main users of the sales web, resulting in a target sample of almost 2500 participants.

The 302 responses received from advisers, adviser consultants and support staff, translate to a response rate of just over 12% - in line with the average (10%) response rate for online questionnaires.

a) SELF-REPORTED USAGE FREQUENCY:

Results: Users were asked to report their usage frequency per transaction according to scale categories provided

Usage frequency	Several times per week	Approx once per day	Several times per day	Cumulative percentage
Transaction 1	32%	9%	37%	78%
Transaction 2	23%	5%	16%	44%
Transaction 3	25%	6%	17%	48%
Transaction 4	11%	6%	5%	22%
Transaction 5	11%	4%	4%	19%
Transaction 6	26%	13%	26%	65%

The transactions that enjoy the most frequent usage are transactions 1 & 6 with 78% and 65% of users respectively, reporting that they used these transactions anything from several times a week to several times a day

b) USER SELF-CATEGORISATION:

Results: Users were asked to select the user category that best described their perception of their usage.

84% and 77% of users categorise themselves as average, above average or frequent users of transactions 1 and 6. This is consistent with the self-reported usage frequency above.

User categorisation: Transaction 1

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	1.3	1.3	1.3
above average user	37	12.3	12.3	13.6
average user	98	32.5	32.5	46.0
frequent user	119	39.4	39.4	85.4
low user	31	10.3	10.3	95.7
non user	13	4.3	4.3	100.0
Total	302	100.0	100.0	

User categorisation: Transaction 2

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	13	4.3	4.3	4.3
above average user	21	7.0	7.0	11.3
average user	106	35.1	35.1	46.4
frequent user	58	19.2	19.2	65.6
low user	70	23.2	23.2	88.7
non user	34	11.3	11.3	100.0
Total	302	100.0	100.0	

User categorisation: Transaction 3

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15	5.0	5.0	5.0
above average user	28	9.3	9.3	14.2
average user	112	37.1	37.1	51.3
frequent user	62	20.5	20.5	71.9
low user	59	19.5	19.5	91.4
non user	26	8.6	8.6	100.0
Total	302	100.0	100.0	

User categorisation: Transaction 4

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	13	4.3	4.3	4.3
above average user	31	10.3	10.3	14.6
average user	87	28.8	28.8	43.4
frequent user	34	11.3	11.3	54.6
low user	106	35.1	35.1	89.7
non user	31	10.3	10.3	100.0
Total	302	100.0	100.0	

User categorisation: Transaction 5

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11	3.6	3.6	3.6
above average user	38	12.6	12.6	16.2
average user	77	25.5	25.5	41.7
frequent user	27	8.9	8.9	50.7
low user	115	38.1	38.1	88.7
non user	34	11.3	11.3	100.0
Total	302	100.0	100.0	

User categorisation: Transaction 6				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5	1.7	1.7	1.7
above average user	53	17.5	17.5	19.2
average user	96	31.8	31.8	51.0
frequent user	84	27.8	27.8	78.8
low user	37	12.3	12.3	91.1
non user	27	8.9	8.9	100.0
Total	302	100.0	100.0	

c) EXTENT OF USAGE OF FUNCTIONALITY:
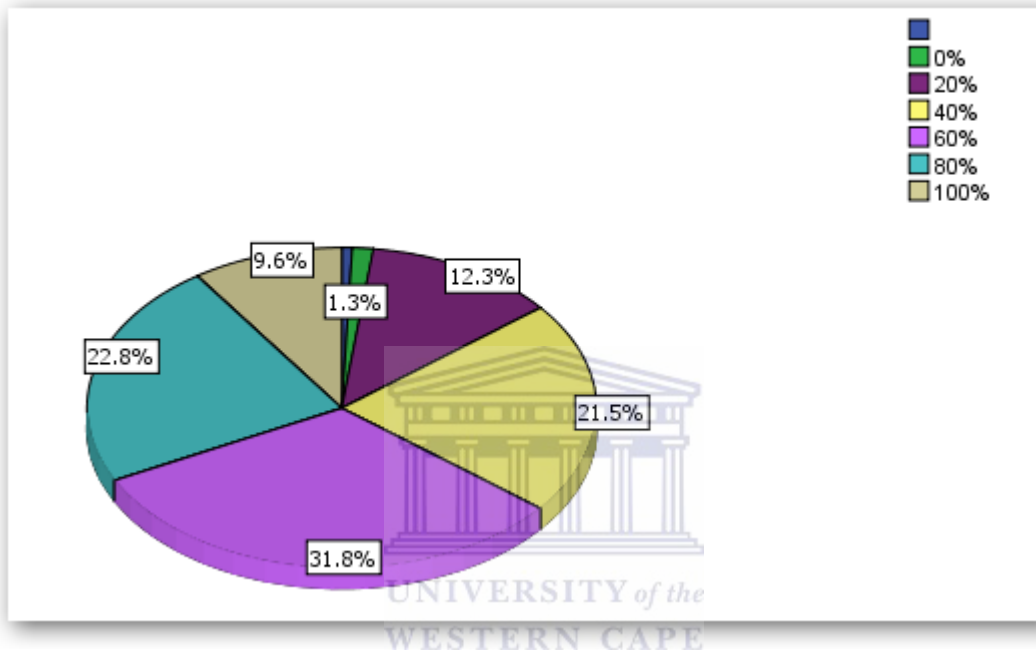
64% of users report that they believe they use 60% - 100% of the functionality available on the sales web.

21% of users report they use only 40% of the site's functionality.

d) SELF-REPORTED USAGE VOLUME:

57% of respondents reported they spend approximately 2 hours per week using these transactions – for 42% of total respondents, usage amounts to approximately 1 hour per week.

e) PERCEIVED USEFULNESS:

90.5% of respondents reported positive perceptions of usefulness in terms of the self-help transactions. Users reported consistently positive perceptions for all the detail questions within the instrument contributing to this construct.

91% of users also stated their agreement that they need to use these transactions to do their job.

Correlation tests show a very significant correlation between Perceived Usefulness and respondents' Attitude towards the system (correlation coefficient=0.888; p=0.000)

f) PERCEIVED EASE OF USE:

While 85% of respondents report that they perceive the self-help transactions to be easy to use overall, several of the detail questions show inconsistent scores for perceived ease of use.

For example:
- 35% of respondents report use of the transactions to be cumbersome
- 33% of users report their interaction with these transactions is often frustrating
- 26% of users find the transactions rigid and inflexible to interact with
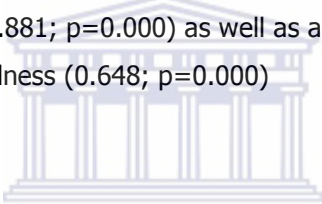- 20% report that it takes a lot of mental effort to become skilful at using the transactions

Correlation tests show a very significant correlation to respondents' Attitude towards the system (correlation coefficient=0.881; p=0.000) as well as a significant correlation to respondents' perception of Usefulness (0.648; p=0.000)

g) ATTITUDE:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	1.000ᵃ	1.000	1.000	.00000	1.000	6.733E17	2	299	.000

a. Predictors: (Constant), Perceived Usefulness, Perceived Ease Of Use

Coefficientsᵃ

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.111E-15	.000		.000	1.000	.000	.000
	Perceived Ease Of Use	.500	.000	.518	5.202E8	.000	.500	.500
	Perceived Usefulness	.500	.000	.583	5.850E8	.000	.500	.500

a. Dependent Variable: Attitude

The constructs Perceived Usefulness and Perceived Ease of Use fully mediate the construct Attitude (R^2 = 1.000). These results once again confirm the findings of Agarwal & Prasad, 1999; Venkatesh, 1999 and Venkatesh, 2000, as did the results of the previous phase of this research (Whyte & Bezuidenhout, 2010).

Perceived usefulness scored a slightly higher beta value at transactional level than in the previous research (beta = 0.583 vs 0.573). Perceived Ease of Use scored slightly lower (beta = 0.518 vs 0.569).

In terms of the construct Attitude, 88% of respondents report an overall positive attitude towards these transactions.

h) SUBJECTIVE NORM:

Management endorsement impact on subjective norm – management endorsement accounted for 64% of the variation in subjective norm (R^2 = 0.637), with users' perceptions of management's efforts to promote usage contributing 57% (beta = 0.570) and users' opinion of whether management want them to use these transactions contributing 44% (beta = 0.441) of this measure.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.799ᵃ	.639	.637	.32177	.639	264.738	2	299	.000

a. Predictors: (Constant), Management does enough to promote usage of these transactions on the Adviser web, Management wants me to use these transactions on the Adviser web

Coefficientsᵃ

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.007	.026		.269	.788	-.044	.058
	Management wants me to use these transactions on the Adviser web	.292	.024	.441	12.337	.000	.245	.338
	Management does enough to promote usage of these transactions on the Adviser web	.316	.020	.570	15.936	.000	.277	.355

a. Dependent Variable: Subjective Norm

While 43% of users reported that management does enough to promote usage of these transactions, 24% disagree, and 30% are unaware of management's efforts.
73% report that they feel management want them to use the self-help transactions.

Most users however reported strong feelings that more could be done to promote usage of the Sales web, and these transactions in particular. They readily volunteered that they imagined there to be lots of potential not yet explored on the sales web, due to ignorance and lack of communication by management.

30% of users stated that colleagues' increased usage would lead to an increase in their own usage. 40% of respondents, however, disagreed. A further 30% appeared to be indifferent towards their colleagues' usage of these transactions.

This is significantly different to the first phase results, where respondents appeared to be almost completely indifferent to their peers' usage, especially in respect of influencing their own usage.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.260[a]	.068	.064	.51634	.068	21.742	1	300	.000

a. Predictors: (Constant), If management promotes these transactions, then it must be useful in doing my job

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.114	.050		2.269	.024	.015	.213
	If management promotes these transactions, then it must be useful in doing my job	.208	.045	.260	4.663	.000	.120	.295

a. Dependent Variable: Subjective Norm

i) INTENTION TO USE:

From the online questionnaire, 95% of users reported their intention to use these transactions.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	1.000[a]	1.000	1.000	.00000	1.000	.	2	299	.

a. Predictors: (Constant), Attitude, Subjective Norm

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-5.730E-16	.000		.	.	.000	.000
	Subjective Norm	.500	.000	.534	.	.	.500	.500
	Attitude	.500	.000	.658	.	.	.500	.500

a. Dependent Variable: IntentionToUse

The constructs Attitude and Subjective norm fully mediated the construct Intention to Use (R² = 1.000). While Attitude still scored stronger as causal antecedent to Intention to use (Beta = 0.658) than Subjective norm (Beta = 0.534), this set of results showed not only higher but significantly stronger correlative and causal scores than the earlier results.

Attitude as antecedent to Intent to use:

Attitude showed a significant correlation to intention to use (R² = 0.762; beta = 0.873; p=0.000)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.873[a]	.762	.761	.24468	.762	958.058	1	300	.000

a. Predictors: (Constant), Attitude

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.028	.021		1.326	.186	-.014	.071
	Attitude	.664	.021	.873	30.953	.000	.621	.706

a. Dependent Variable: IntentionToUse

Subjective norm as antecedent to Intent to use:

Subjective norm also showed a significant correlation to intention to use (R^2 = 0.638; beta = 0.799; p= 0.000)

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.799ª	.638	.637	.30154	.638	528.353	1	300	.000

a. Predictors: (Constant), Subjective Norm

Coefficientsª

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.301	.020		15.087	.000	.262	.340
	Subjective Norm	.748	.033	.799	22.986	.000	.684	.812

a. Dependent Variable: IntentionToUse

j) USAGE BEHAVIOUR:

Sales web

Usage of Transaction 1 and 6 (highest volume transactions of the 6 transactions tested) have been measured for the 6 months' period preceding and following the usability work that was done (the more usable version of the transactions was implemented beginning of January 2009. Usage stats are as follows:

Intermediary traffic – Transaction 1

July 2009	Aug 2009	Sept 2009	Oct 2009	Nov 2009	Dec 2009	Average/month
72234	67473	71151	76020	69283	34828	**66081**

Jan 2010	Feb 2010	Mar 2010	Apr 2010	May 2010	June 2010	Average/month
72186	76983	81830	66944	84473	82738	**77526**

Support staff traffic – Transaction 1

July 2009	Aug 2009	Sept 2009	Oct 2009	Nov 2009	Dec 2009	Average/month
96943	90852	91551	77676	80992	38329	**79390**

Jan 2010	Feb 2010	Mar 2010	Apr 2010	May 2010	June 2010	Average/month
61699	75259	81881	69984	86560	78315	**75616**

Intermediary traffic – Transaction 6

July 2009	Aug 2009	Sept 2009	Oct 2009	Nov 2009	Dec 2009	Average/month
10030	17067	17726	18368	16997	10233	**15070**

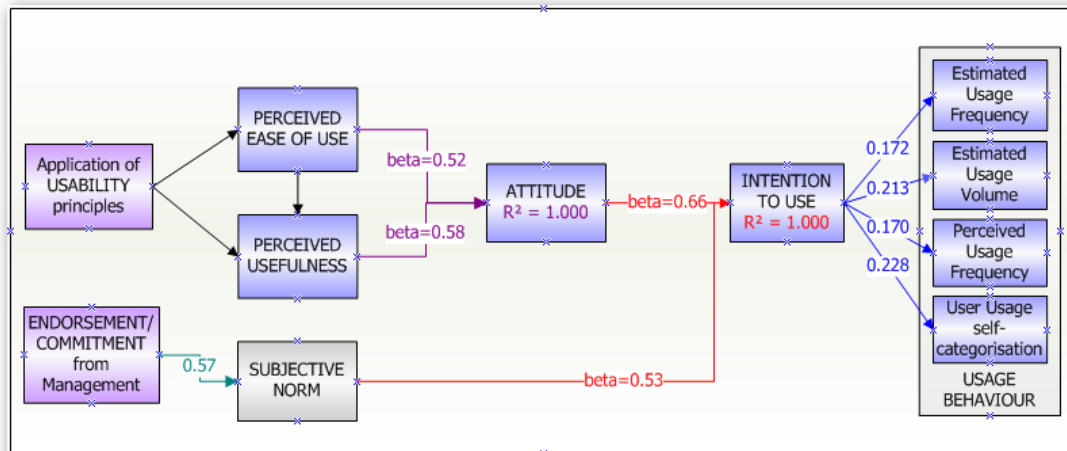| Jan 2010	Feb 2010	Mar 2010	Apr 2010	May 2010	June 2010	Average/month
15371	16731	14363	16484	18089	21364	**17067**

k) CONCEPTUAL RESEARCH MODEL RESULTS:

Figure 7: Conceptual Research Model (updated with phase 2 results for the sales web)

ONLINE QUESTIONNAIRE – CORPORATE SITE

a) QUESTIONNAIRE RESULTS: CAREERS SECTION

An invitation pop-up was published on the corporate public site on the Careers section homepage. One in four visitors was presented with the invitation to participate in the survey. The survey received 290 responses from public users.
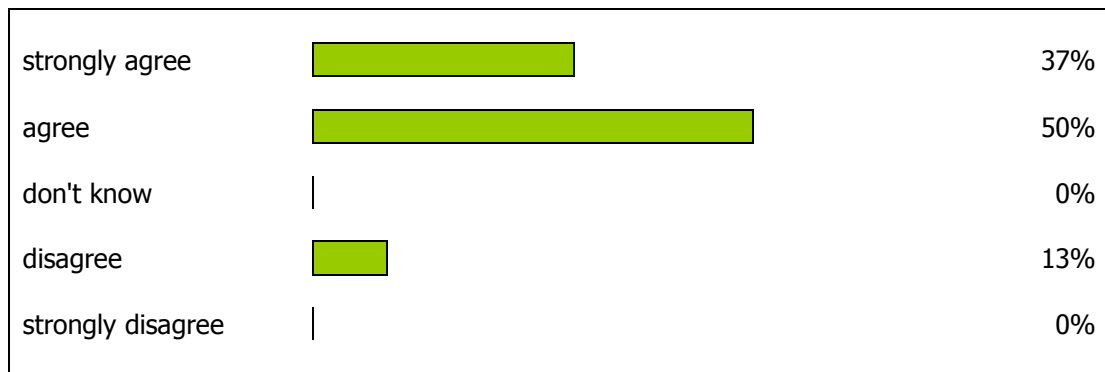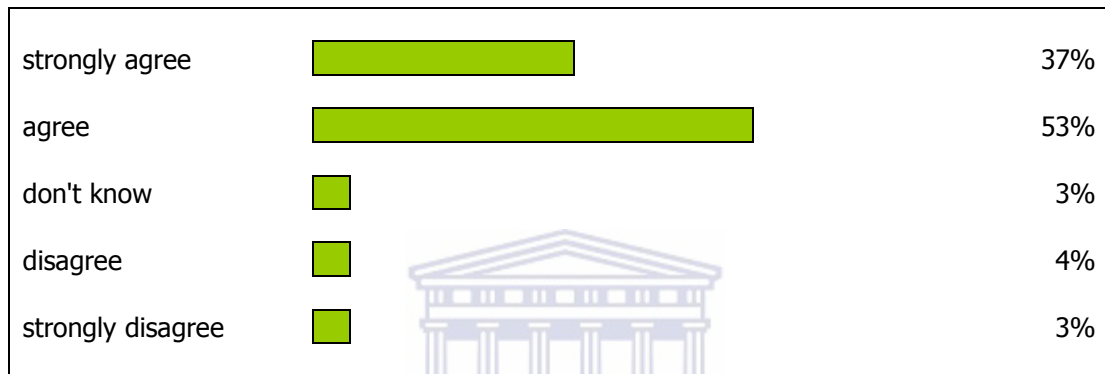
1. Was the website easy to use?

Yes	88%
No	12%

2. Was the information useful and relevant?

Yes	95%
No	5%

3. Were you able to successfully complete what you wanted to do? Did you find what you were looking for?

strongly agree		37%
agree		50%
don't know		0%
disagree		13%
strongly disagree		0%

4. I found it easy to learn to use the website

strongly agree		37%
agree		53%
don't know		3%
disagree		4%
strongly disagree		3%

5. I am able to find what I want quickly and efficiently

strongly agree		33%
agree		51%
don't know		5%
disagree		7%
strongly disagree		4%

6. If I come back to the website next week, I will remember how to find what I need

strongly agree		45%
agree		42%
don't know		6%
disagree		3.5%
strongly disagree		3.5%

7. Overall, I consider this a successful website

strongly agree	40%
agree	46%
don't know	4%
disagree	7%
strongly disagree	3%
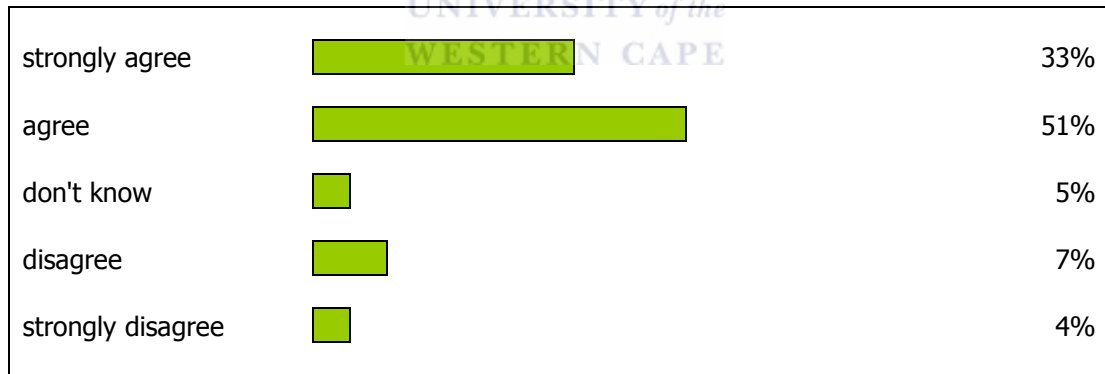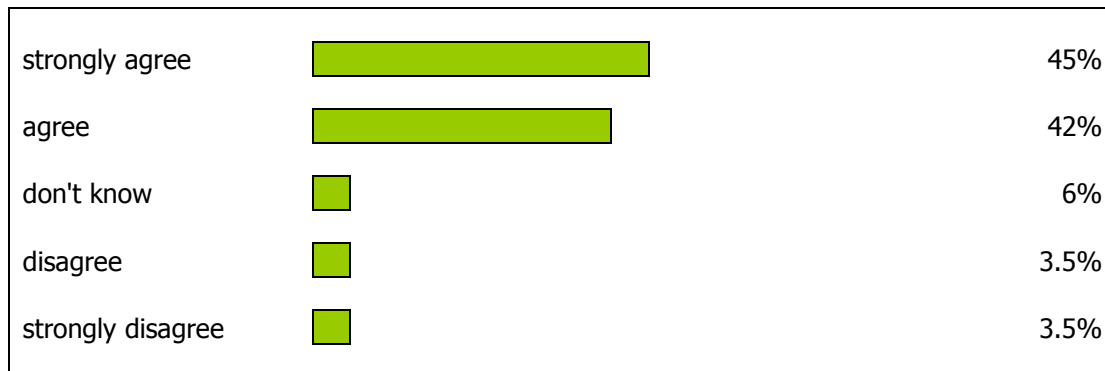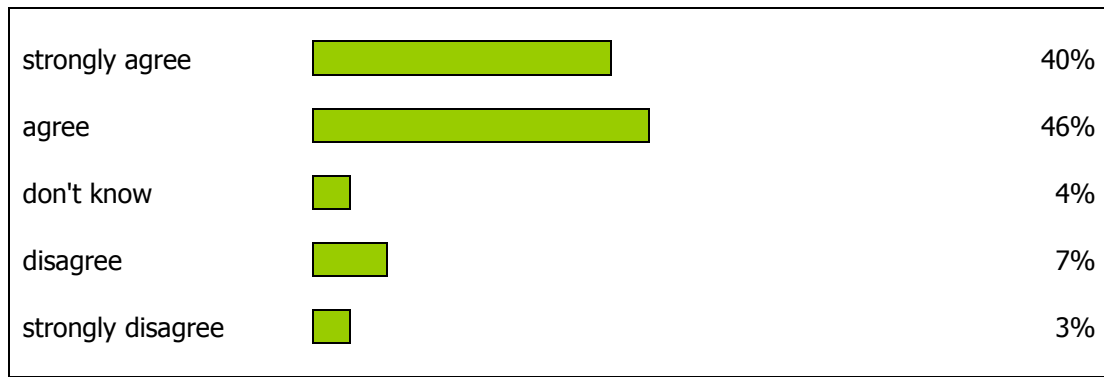
8. How often do you use the website?

it's my first time	24%
once every couple of months	19%
once a month	14%
once a week	16%
couple of times a week	17%
daily	10%

9. Do you intend to use this website again in future?

Yes	99%
No	1%
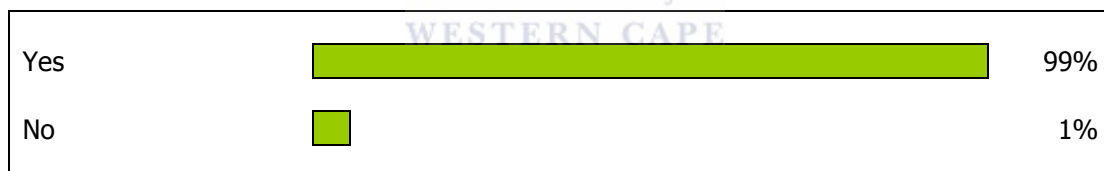
b) USABILITY AS ANTECEDENT

Linear multiple regression analysis was used to test causal relationships between usability attributes and the constructs Perceived Ease of use and Perceived Usefulness. The Stepwise method was used where individual attributes/variables are systematically included and then excluded from the analysis to find the combination of variables that produce the most significant impact.

The mean of all the usability attributes as defined in the literature (Nielsen, 1999) were combined to compute a 'Measure of Usability' for use in the analysis.

The analysis shows a significant causal relationship between Usability and Perceived Ease of use (beta = 0.568), and a slightly less significant causal relationship between Usability and Perceived Usefulness (beta = 0.428).

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.666	.045		14.755	.000
	Usability	.240	.022	.568	10.816	.000

a. Dependent Variable: PEOU

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.823	.033		25.191	.000
	Usability	.119	.016	.428	7.412	.000

a. Dependent Variable: PU

Then, individual attributes were used in the analysis to determine which attributes have a greater or more significant causal relationship to the CRM constructs Perceived Ease of use and Perceived Usefulness.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.792	.035		22.390	.000
	Efficiency	.172	.016	.560	10.593	.000
2	(Constant)	.762	.038		20.249	.000
	Efficiency	.133	.024	.434	5.461	.000
	Learnability	.060	.028	.169	2.129	.034

a. Dependent Variable: PEOU

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.896	.025		35.375	.000
	Satisfaction	.087	.013	.402	6.862	.000
2	(Constant)	.780	.042		18.659	.000
	Satisfaction	.067	.014	.310	4.895	.000
	Effectiveness	.068	.020	.217	3.431	.001

a. Dependent Variable: PU

c) ATTITUDE:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1.000[a]	1.000	1.000	.000

a. Predictors: (Constant), Wastheinformationusefulandrelevant, Wasthewebsiteeasytouse

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.734E-16	.000		.000	1.000
	Wasthewebsiteeasytouse	.500	.000	.739	7.384E7	.000
	Wastheinformationuseful andrelevant	.500	.000	.739	7.384E7	.000

a. Dependent Variable: Attitude

As with the sales web results, the CRM constructs Perceived Ease of Use and Perceived Usefulness were fully mediated by the construct Attitude, as with other TAM research.

d) USAGE:

The redesign to this section to apply usability principles was implemented in April 2009. Usage statistics were gathered for the last 6 months period on the old website and for the 6 month period on the corresponding site area following the launch of the new website.

The following graph shows the usage pattern before and after the launch of the redesigned site area (implementation date marked with dashed line):

Careers Site area stats BEFORE redesign:

Oct 2008	Nov 2008	Dec 2008	Jan 2009	Feb 2009	Mar 2009	Average/month
1957	1851	1270	2356	2160	2270	**1977**

Careers Site area stats AFTER redesign:

Apr 2009	May 2009	June 2009	July 2009	Aug 2009	Sept 2009	Average/month
4069	7686	7376	8594	8798	8564	**7515**

These stats show a remarkable increase in usage after the application of usability principles to the website area.
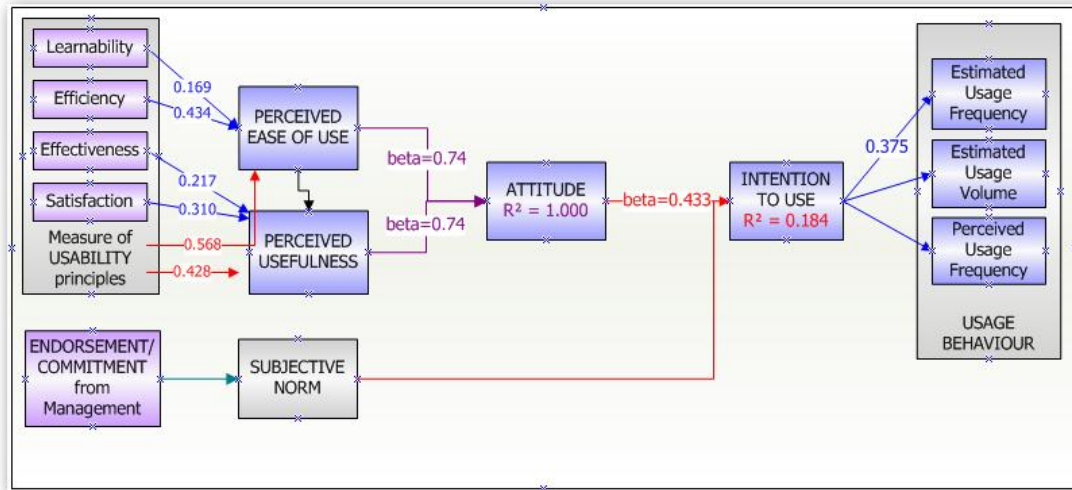
e) CONCEPTUAL RESEARCH MODEL RESULTS:

Figure 8: Conceptual Research Model (updated with phase 2 results for the public corporate site, and refined/expanded to show usability attributes tested)

Chapter 5: DISCUSSION, CONCLUSION & RECOMMENDATIONS

DISCUSSION OF FINDINGS:

RESPONSES:

The response from the sales web users and the public site was consistent with the average response rate for online questionnaires.

INHIBITORS TO USAGE:

Anecdotal evidence shows that sales web respondents have a huge need for training. Almost 40% of respondents cite lack of training as an inhibitor to increased usage. This is consistent with the feedback received from the first phase of the research (Whyte & Bezuidenhout, 2010).

This could also account for the inconsistencies in the detail aspects of perceived ease of use responses. The transactions on which the survey was based are critical and quite complex transactions. It appears that while the majority of respondents report that overall they perceive the transactions to be easy to use, there are detail aspects of the construct that training could definitely address e.g. The level of mental effort required for users to become skilful at using the transactions. If users receive adequate training in performing these transactions, they would not need to expend this mental effort in attempting to figure out how to use these transactions on their own.

TAM ASPECTS OF CRM:

Previous TAM research has been validated once again not only through the first phase, but also from results of both sets of data from the second phase of the research, in that Attitude has once again proven fully mediated by Perceived Ease of Use and Perceived Usefulness.

Results from the second phase of the research (sales web results) also prove Intention is fully mediated by Attitude and Subjective Norm. This result is significant as it aligns with results from other TAM research, including results from Davis' own studies.

SUBJECTIVE NORM:

The first phase of the research found very weak evidence for the inclusion of subjective norm as antecedent to Intention to use (beta = 0.126; R^2 = 0.463). The reason posited in the first phase appears to be valid: Unit of analysis – based on the adviser web as a whole – has impacted the correlation to intention to use.

Since users were using only a small part of the site, and yet being asked to report their perceptions of the whole site, it seems logical that reports from users would be inconsistent.

This research also found that Management efforts targeted at specific parts of the site/functionality were not enough to influence users' perceptions of the whole site.

Anecdotal evidence from the first phase of the research highlighted a very negative perception of management efforts with respect to the usage and benefits of the sales web.

For the second phase of the research, business transactions were selected where usability had been applied and management efforts applied to endorsing and advocating the use of these transactions. This has proven to be successful in influencing users' perceptions positively with respect to the usability of the sales web and their intended usage of the site.

Using these 6 specific business transactions as the unit of analysis has provided astounding results in comparison to the first phase when users' perceptions were based on the sales web as a whole. Significantly stronger results have been achieved during the second phase of this research in respect not only of subjective norm (beta = 0.534 versus 0.126 for first phase), but also in respect of more positive perceptions of management efforts.

Intention to use is fully mediated by Attitude and Subjective norm, lending strong support (through empirical evidence) for the inclusion of Subjective norm in the Conceptual Research Model in addition to TAM constructs.

The significant correlation between Management endorsement/commitment and subjective norm provides management with a clear understanding of what is required from them in addition to improving the usability of their websites and web applications.

USABILITY ATTRIBUTES:
The analysis gave us great insight into what specific attributes would impact the model constructs most significantly. Organisations can use these results to more specifically address individual constructs that are identified as needing work.

Efficiency and Learnability were identified by the analysis as the usability attributes that have the most impact on Perceived Ease of use, whereas Effectiveness and Satisfaction are most significant for Perceived Usefulness.

Memorability, as a usability attribute/variable, was not only excluded by the analysis, but the significance of the remaining variables actually increased when the Memorability attribute was excluded.

Since an important part of the application of usability is to create a website or web application that is intuitive to users, this may account for why Memorability was not

significant as a determining usability attribute. Users do not want to have to remember/memorise how to use a website – usage should be intuitive and easy. TAM has proven the importance of Perceived Ease of use, and this analysis has confirmed this, even in the specific attributes of usability that have the greatest impact in terms of causal relationships.

USABILITY AND USAGE:

Through the application of usability principles to the self-help transactions on the sales web and the Careers section of the corporate site, the organisation was able to increase usage of the relevant transactions and site area significantly. Not only did the intermediary traffic for Transaction 1 increased by 19%, the support staff traffic also decreased by 5%. This seems to indicate that the application of usability not only resulted in increased usage of the transaction by the intended primary audience, but making the transaction more usable also resulted in the intermediaries being more likely to do the transaction themselves, rather than contact the support staff to do it for them.

Usage of Transaction 6 increased by just over 13% since the application of usability principles.

One of the main objectives in redesigning the corporate site with the application of usability, was to ensure that users are able to effectively achieve the tasks they set out to do. Almost 90% of respondents report that they were able to successfully complete their task and find what they were looking for. This is a remarkable achievement that once again lends support for the application of usability.

Since the large-scale redesign of the corporate site to specifically apply usability principles, the specific site area surveyed achieved a phenomenal degree of increased usage. Usage for this site area increased by over 380% which leaves no doubt as to the power of usability and its benefits to the business, as well as the direct impact on the business' potential to recoup its investment in web applications and websites.

<u>RESULTS OF HYPOTHESES TESTS</u>

<u>a) RESEARCH SUB-HYPOTHESES:</u>

H1 – There is no evidence to support the inclusion of the application of usability principles as an antecedent to Perception of Ease-of-Use and Perception of Usefulness

Result: reject null hypothesis. This research has provided evidence to suggest that the application of usability principles will have an impact on TAM constructs Perceived Ease of use and Perceived Usefulness. While the usability attributes do not fully mediate PEOU and PU, they do provide organisations and academics with a basis from which to work in respect of how to go about positively influencing these vital constructs.

H2 – Optionality does not impact on the predictability of the Conceptual Research Model (CRM), particularly in the organisational context

Result: Inconclusive. In the absence of conclusive empirical evidence, anecdotal evidence from users was studied. 30% of users of the mandated sales web application state that they would prefer to use an alternative channel if the same information was available via the alternative, suggesting some support for rejecting the null hypothesis. There was also a set of users (however minimal) that refused to use the sales web application regardless of use being mandated, suggesting that Optionality will not impact the CRM's predictability. On the other hand, use of the corporate site is completely voluntary, and even though close to 15% were not successful in completing their tasks, 99% of public users state that they intend to use the website again in the future, suggesting support for accepting the null hypothesis. This highlights an area for future research.

H3 – The CRM does not provide us with greater understanding of usage behaviour

Result: reject null hypothesis. Analysis has identified specific attributes from the CRM that have a more significant impact on the perceptual constructs PEOU and PU, and also identified which usability attributes will impact which construct. The analysis has also identified that Memorability does not impact these constructs and can be excluded. The CRM has therefore given us a greater understanding of which specific aspects organisations should address to positively influence usage behaviour.

H4 – Using specific functions/modules as units of analyses will have no impact on the inclusion of subjective norm

Result: reject null hypothesis. Using specific functions or transactions as unit of analysis had a significant impact on the inclusion of subjective norm. In the first phase of the research when the whole system was used as unit of analysis, subjective norm showed a very weak

causal relationship to Intention to use (beta = 0.126; R^2 = 0.463) Whyte & Bezuidenhout, 2010. With the second phase of the research with specific transactions as unit of analysis showed a significantly stronger causal relationship (beta = 0.534) to Intention to use. Intention to use was fully mediated by Attitude (beta = 0.658) and Subjective Norm (beta = 0.534; R^2 = 1.000) lending full support for the inclusion of subjective norm in the CRM.

H5 – Subjective norm will have no impact on usage behaviour through Perception of Usefulness

Result: reject null hypothesis. While the causal relationship identified by the analysis was not particularly significant (beta = 0.430; R^2 = 0.182), this did confirm that Subjective Norm had some impact on usage behaviour through Usefulness as well as on Intention to Use. However, this has only been analysed using the mandated web application where Subjective Norm is relevant.

b) RESEARCH – MAIN HYPOTHESIS:

H0 – There is no evidence to suggest that the Conceptual Research Model is a significant predictor of usage behaviour

Result: Reject null hypothesis. Not only have the correlations and causal relationships between the CRM constructs been identified and confirmed empirically by this research, but overwhelming evidence has been provided through additional archival data that has been investigated. Usage data taken from web analytics in respect of usage before and after the application of usability principles to both systems included in the research, has provided overwhelmingly strong evidence for the CRM.

This research has enabled the refining of the CRM in that specific attributes of usability were identified and their specific impact on the constructs within the CRM have been exposed.
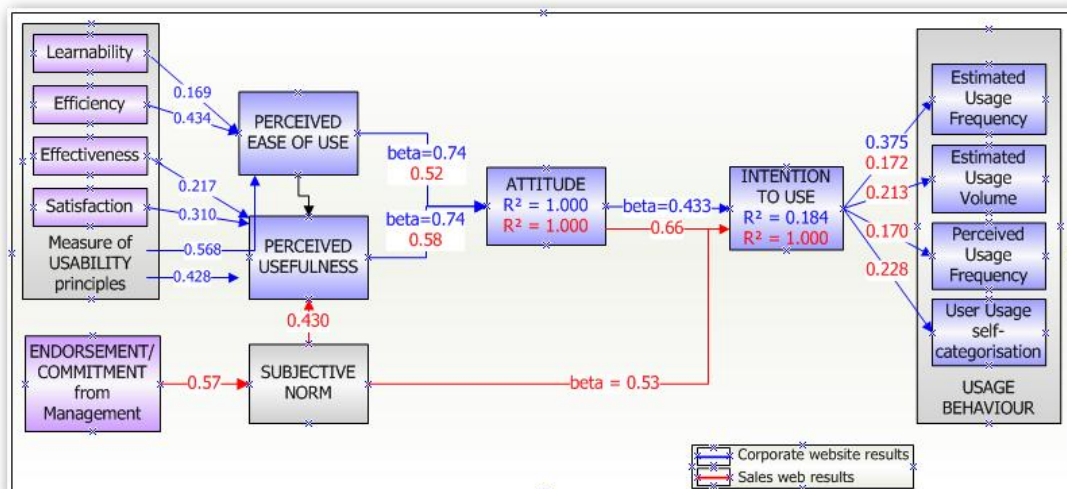

Figure 9: Conceptual Research Model (with results from complete analysis)

CONCLUSIONS:

Widespread research has shown TAM's suitability to diagnosing reasons for lack of acceptance and minimal usage, as well as demonstrating how important users' perceptions are in influencing, predicting and understanding usage behaviour, as previously also corroborated by Davis (1989), McKechnie et al (2006) and Chin et al 2008), amongst others. The literature review of this study has met the objective of assessing the CRM against the published literature to validate the inclusion of all the constructs proposed in the CRM.

Empirical evidence from this research has validated the inclusion of the TAM constructs in the Conceptual Research Model, and has also provided equally strong evidence for the inclusion of subjective norm (from The Theory of Reasoned Action) in addition to the TAM constructs.

The remarkable increase in usage since the application of usability on the sales web and the corporate site validates the inclusion of the application of usability principles as a construct in the CRM. It also provides clear guidance to Management in terms of what specific actions can be taken, and which attributes of websites and applications need to be addressed, in order to increase usage as well as break patterns of non-usage for web applications and websites.

This meets three of the main objectives of this research in confirming not only the significant relationships between the application of usability and other constructs, but also highlighting specific practical actions that the organisation could take to impact usage behaviour positively. This also provides the CRM as a possible solution to other similar organisations facing similar problems in respect of technology adoption/usage, after the successful validation of the CRM in this financial services organisation.

And yet, empirical evidence shows that for a web application in the organisational context (sales web), it is not enough for organisations to just make their web applications more usable. Management needs to sufficiently demonstrate their commitment to making applications more usable for the users, as well as aim their efforts at communicating the benefits of a more usable application and increased usage of said application in achieving users' work objectives.

Feedback from users has also pointed strongly to management needing to make training a vital part of their efforts to increase usage of critical web applications, thus also confirming that subjective norm plays a part in the Conceptual Research Model.

Dzida (1996), Norman (as cited by Mahlke, 2002) and Hilbert & Redmiles (2000) agree that the entire interaction between the user and the product must be taken into account, as the experience of individuals can vary depending on background knowledge, experience of the users, the tasks which they perform, and the context in which it is used.

Extensive research (going back decades) corroborates the importance of training, from educating users to use technology in specific work scenarios, to using training to influence users' perceptions of specific systems in terms of its usefulness to users, to how managements efforts in this respect can also positively impact users' technology adoption/usage – Nelson & Cheney (1987), Igbaria (1990), Thompson et al (1991), Venkatesh (1999) and Schillewaert et al (2005).

In terms of the research question of whether optionality impacts on the predictability of the CRM, it appears that optionality does not play a role once the usability of the target application has been addressed.

The ultimate aim of the CRM is to address usage of a website or application. The application of usability principles to both the sales web and the corporate website has resulted in marked improvement in usage of these web applications. Where respondents were interrogated as to their usage intentions if another channel to retrieve the information is available, optionality has not had an impact on users' intentions. Indeed, not only has usage of the sales web increased, but usage via the alternative channels has decreased since the application of usability. The actual usage increase speaks louder than any other tests that the application of usability ultimately impacts usage positively.

While TAM is a widely adopted and accepted model as a predictor of technology adoption, it is a theoretically grounded approach to help organisations understand the predictors of user adoption of a technology. However, it leaves the organisation with no specific guidelines as to how to positively impact the constructs that TAM defines.

There is also a shortcoming in TAM in respect of the more social influence aspect of what impacts user behaviour, and the construct subjective norm is key to organisations' understanding of everything that is required to positively influence user behaviour.

The conceptual research model aims to provide organisations with a more guided approach as to what specific aspects of their websites and web applications they can address to increase usage of their applications, and ultimately achieve the desired return on investment.

This research has provided some evidence for which specific usability attributes organisations can focus their energy on in order to implement the learning from the CRM. Four specific usability attributes have been identified by this research as a starting point for organisations and academia seeking to solve the problem of inadequate or minimal usage of web systems. Even the exclusion of Memorability as an antecedent to PEOU and PU constructs provides some learning for organisations.

This research has shown that the concept of usability, derived from various social, perceptual, cognitive and computer sciences, is vital in the design and implementation of websites and web applications to ensure user adoption and acceptance of these widespread technologies.

RECOMMENDATIONS FOR FUTURE RESEARCH:

This research has provided strong evidence for the constructs that have been added to the TAM model to form the CRM.

Future research should be aimed not only at testing the CRM in the context of a company's public site, but should also be aimed at testing the CRM applied to multiple websites or site areas, to test robustness of the model.

Future research should aim to identify what other usability attributes act as antecedents to Perceived Ease of use and Perceived Usefulness, in order to eventually be able to provide organisations with a checklist of practical actions that they can implement in order to bring about the desired usage behaviour through the various constructs included in the CRM.

Future research should also aim to test the CRM with websites or applications of various companies and different audiences. If possible, the CRM should be tested across industries other than financial services in order to generalise the findings, and determine the CRM as a model relevant to increased usage of all websites and web applications.

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Appendix 1:
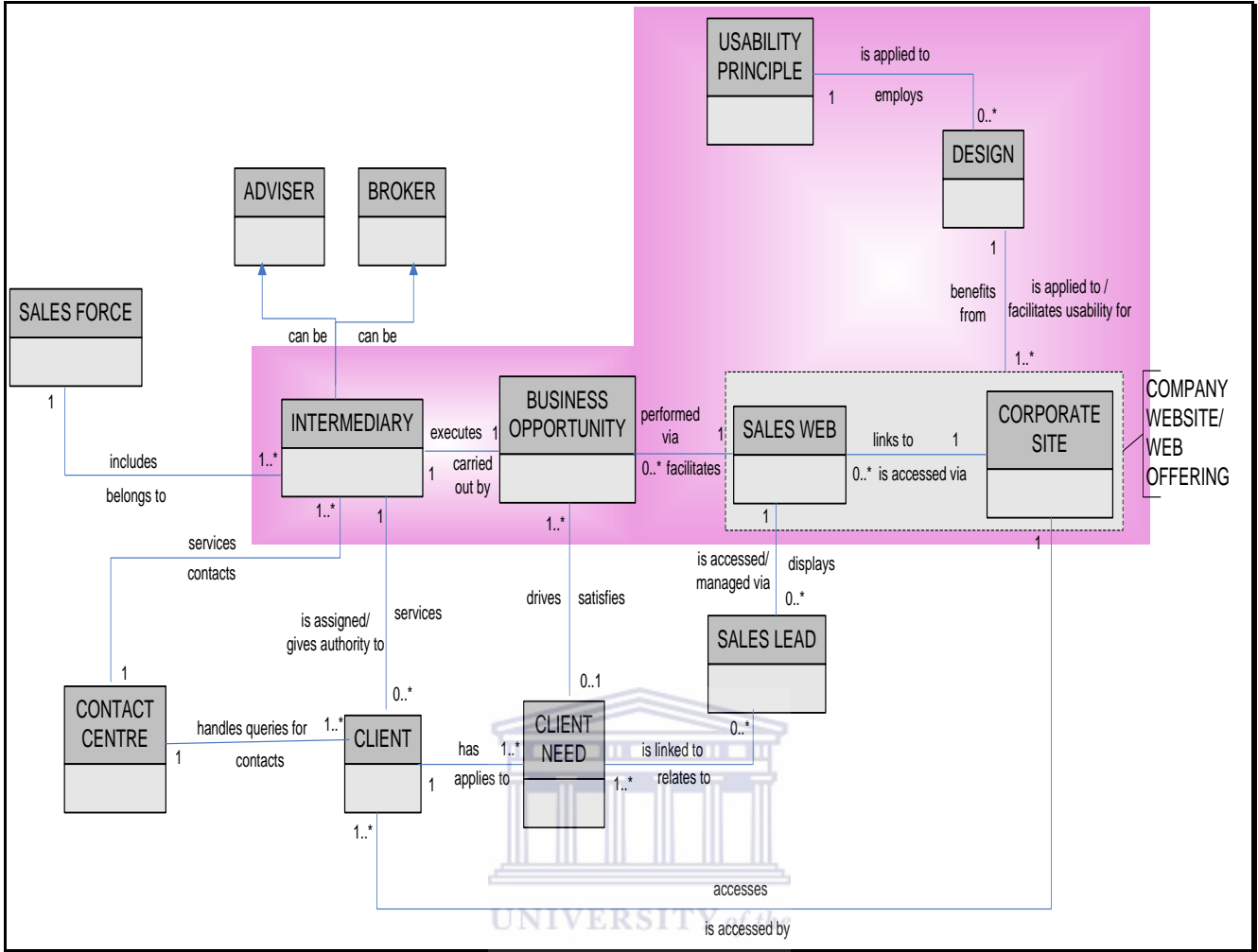
Entity Relationship Diagram (ERD) indicating scope of the research

Appendix 2:

INSTRUMENT DESIGN

ONLINE QUESTIONNAIRE #1 – INTERMEDIARIES, SALES SUPPORT STAFF

Questions to gather data on users and their estimated current usage of 6 self-help

transactions (matrix – frequency per transaction):

1. Don't use at all
2. Use less than once a week
3. Use about once a week
4. Use several times each week
5. Use about once a day
6. Use several times a day

Please specify (estimate) how many hours each week you normally spend using these

transactions on the Adviser/Broker web: [___] hours

I believe my usage of these transactions is that of a: (matrix)

1. Non user
2. Low user
3. Average user
4. Above average user
5. Frequent user

Overall, I believe I use _% of the functionality available on the sales web

1. 0%
2. 20%
3. 40%
4. 60%
5. 80%
6. 100%

Questions to gather data on Perceived Usefulness:

1. Using the Adviser web improves the quality of the work I do
2. Using the Adviser web gives me greater control over my work
3. The Adviser web enables me to accomplish tasks more quickly
4. The Adviser web supports critical aspects of my job
5. Using the Adviser web increases my productivity
6. Using the Adviser web improves my job performance
7. Using the Adviser web allows me to accomplish more work than would otherwise have been possible
8. Using the Adviser web enhances my effectiveness on the job
9. Using the Adviser web makes it easier to do my job
10. Overall, I find the Adviser web useful in my job

These questions will be answered by means of a 5-point Likert scale where 1=strongly

disagree; 2=disagree; 3=don't know; 4=agree; 5=strongly agree

Questions to gather data on Perceived Ease-of-Use:

1. I find the Adviser web cumbersome to use
2. Learning to operate the Adviser web is easy for me

3. Interacting with the Adviser web is often frustrating
4. I find it easy to get the Adviser web to do what I want it to do
5. The Adviser web is rigid and inflexible to interact with
6. It is easy for me to remember how to perform tasks using the Adviser web
7. Interacting with the Adviser web requires a lot of mental effort
8. My interaction with the Adviser web is clear and understandable
9. I find it takes a lot of effort to become skillful at using the Adviser web
10. Overall, I find the Adviser web easy to use

These questions will be answered by means of a 5-point Likert scale where 1=strongly

disagree; 2=disagree; 3=don't know; 4=agree; 5=strongly agree

Questions to gather data on Subjective Norm:

1. Management wants me to use these transactions on the Adviser web
2. Most of my colleagues use these transactions on the Adviser web
3. If my colleagues used these transactions on the Adviser web more, I would too
4. Management does enough to promote usage of these transactions
5. Overall, I agree that I need to use these transactions on the sales web to do my job

These questions will be answered by means of a 5-point Likert scale where 1=strongly

disagree; 2=disagree; 3=don't know; 4=agree; 5=strongly agree

As an independent measure of the user's perception of the Adviser web:

1. Overall, I agree that the Adviser web is a successful system
2. I intend to use/carry on using the Adviser web to help me in doing my job
3. If an alternative channel is available for the same information (e.g. Contacting the call centre), I would use it rather than the Adviser web
4. If management promotes these transactions, then it must be useful in doing my job

These questions will be answered by means of a 5-point Likert scale where 1=strongly

disagree; 2=disagree; 3=don't know; 4=agree; 5=strongly agree

ONLINE QUESTIONNAIRE #2 – PUBLIC USERS

Was the website easy to use? (Ease-of-use)

Was the information relevant and useful? (Usefulness)

Were you able to successfully complete what you wanted to do? Did you find what you were

looking for? (Effectiveness)

- Yes
- No

If not, what went wrong? (Barriers to usage)

I found it easy to learn to use the website (Learnability)

I am able to find what I want quickly and efficiently (Efficiency)

If I come back to the website next week, I will remember how to find what I need

(Memorability)

Overall, I consider this a successful website (Satisfaction)

How often do you use this website? (Self-reported usage frequency)

- It's my first time
- Once every couple of months
- Once a month
- Once a week
- Couple of times a week
- Daily

Do you intend to use this website again in the future? (Intention)