

BENEFITS THAT A BUSINESS CAN DERIVE FROM HUMAN-COMPUTER INTERACTION INTERVENTIONS

by

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DISCLAIMER

I declare that “Benefits that a business can derive from Human-Computer Interaction interventions” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

Further, I declare that I have not previously submitted this work, or part of it, for examination at the University of South Africa (UNISA) for another qualification or at any other higher institution of education.

SIGNATURE

February 28, 2014

DATE



Dedicated with memories and love

to

Daudi Nabusiu

.....
You gave me hope. Left me to make it through.

ABSTRACT

Human Computer Interaction (HCI) interventions such as User Experience, Usability and Accessibility are widely accepted as great milestones in the developmental process of computer-based system applications – be it web-based, PC-based or ubiquitous. However, there is still a need for an understanding of the critical benefits – both tangible and intangible – that HCI interventions may bring within business. It is still necessary to investigate and clearly understand how the issues that emanate from the usability and accessibility problems affect business as well as what value HCI techniques contribute to the profitability of implementing and using computer-based systems.

A case study approach was undertaken within a Travel Management Company (TMC) on a computer-based system used for both back-end and front-end activities, such as invoicing as well as Management Information System (MIS) reports. The aim was to ascertain how the incorporation of HCI interventions (Usability and Accessibility) in evaluating the design and the development process of software applications can impact on the usefulness of such computer application systems. The investigation in areas such as the redefining business processes in order to generate a competitive advantage, enhancing user skills, improving user productivity, user satisfaction and retention, reducing training costs, and quality service provision were of particular interest.

The end results of the study affirm an important and significant role that specific and focussed HCI interventions make in the successful implementation of contemporary computer-based systems. However, for businesses to gain most of the potential benefits from HCI interventions, both the software development houses and business practitioners should make use of the HCI techniques and place greater priority and emphasis on the awareness and use of HCI (Usability) standards in the development process.

Key Words: Accessibility, HCI Interventions, Business Benefits, HCI Frameworks, HCI processes and methodologies, Service, Service Science, Service System, Usability

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CHAPTER 1: INTRODUCTION AND OVERVIEW

1.1 Introduction

Many businesses often launch products or services that contain significant, known usability flaws. This is done for seemingly valid business reasons, for example, to gain a first-mover advantage in the market (Bias and Mayhew, 2005; Heppner et al., 2005). However, some, if not most of the usability flaws in the products or services could be fixed before launch by following certain development practises (Boehm, 1991; Heppner et al., 2005; Kling, 2000; Preece et al., 2011). In extreme cases, launching a product or system or service that fails to meet users' expectations has led to failure of the business case (Landauer, 1996; Lazar et al., 2004; Mentis and Gay, 2003; Murrell and Sprinkle, 1993).

Looking at computer-based systems, it is common that some of the products or systems have struggled with user acceptance (Landauer, 1996; Mentis and Gay, 2003). This is as a result of either usability flaws within the system or negative user attitude and perception. The lack of user acceptance can cost businesses lost productivity, high training costs for users to get acquainted with the system interface and navigation, and user frustration (Lazar et al., 2005; Preece et al., 2011; Sharp et al., 2007). Sometimes, implementation of change becomes difficult as well as costly.

According to Heppner et al. (2005), the results of launching flawed products often manifest in reduced usage of that product. The reduction in product usage significantly impacts on expected business benefits such as quick return on investment (ROI). Studies have also shown that 80% of the total system maintenance costs incurred have been related to users having problems or concerns with the systems and not with a system's technical flaws (e.g. Boehm, 1991; Landauer, 1996); of this, 64% is directly related to system usability problems (Landauer, 1996; Mentis and Gay, 2003).

This study investigated the application of a selection of Human-Computer Interaction (HCI) processes and methodologies on a computer-based system called the ACCtrav system. The ACCtrav system was used in a company providing corporate travel management services. The goal of the study was to explore usability

challenges experienced by users of the ACCtrav system and how the usability challenges affected business. The ACCtrav system was later replaced with the Logiwiz system. This study sought to emphasise the benefits that a business could derive from implementing HCI processes and methodologies during systems development. The anticipated benefits were to be in areas such as improved user productivity, free publicity or branding, and improved business operations. Quality service provision was of particular interest.

1.2 Developing the idea of the study

Many travel management companies (TMCs) have moved towards adopting computer-based systems in fulfilling service provision. This is motivated by cutting down operational costs (Bias and Mayhew, 2005; Karat, 1990; Nielsen, 1993) and a presupposed better appeal to customers (Jones and Sasser, 1995; Jones and Samalionis, 2008; Heppner et al., 2005; Luthria and Rabhi, 2009; Magoulas and Chen, 2006; Berry and Parasuraman, 1993). Businesses are compelled to adopt computer-based systems due to forces in the global economic environment.

The 2008 global economic depression, however, brought major challenges such as how businesses should cope with technology and the related costs involved, while, at the same time, trying to appeal to new customer demands (Jones and Sasser, 1995; Jones and Samalionis, 2008; Luthria and Rabhi, 2009). For example, introducing a new technology can cause high training costs and job stress that may lead to staff burnout and impact on turnover (Lazar et al., 2005; Landauer, 1996).

As businesses work to cope with technology and customer challenges, it is clear that human activities in the services industry cannot simply be replaced with technology or computer-based systems (Cai et al., 2008; Kaner and Karni, 2006; Vargo and Lusch, 2004). The dependence emanates from the fact that services usually involve a mutually supporting network of human activities that technology cannot impersonate completely (Cockton, 2006; IfM and IBM, 2008; Landauer, 1996; Shneiderman, 2000). As a result, the management of human influence still stands out as one of the critical success factors (Cockton, 2006; Mele et al., 2009; Parker and Heapy, 2006).

Secondly, looking at the problem statement in the next section, one realises that travel services are unique and risky due to their complicated nature, set-up, and reliance on external driving forces in the global economic environment (Jones and Samalionis, 2008; Lovelock and Gummesson, 2004). Travel services are often characterised by real-time transactions, dynamic customer requirements (Jones and Sasser, 1995), and fast-changing technologies which often require instant changes in the service provision (Luthria and Rabhi, 2009). As a result, there is a possibility that most of the developers of computer-based systems used by TMCs do not make use of HCI interventions in the development process or thereafter.

1.3 The problem statement

Sections 1.3.1 to 1.3.5 cover the discussions on the scope, the computer-based systems (the ACCtrav and Logiwiz systems) used by the TMC as well as the articulation how these helped in forming the problem statement.

1.3.1 The background

Two surveys were instituted by the TMC in 2010. The survey among internal staff (employees) and customers respectively were aimed at understanding the challenges that had emanated from the merger with another TMC in 2009 (BCDtravel, 2010). Based on the survey results from the staff, it was discovered that there were internal issues related to computer systems. The results revealed dissatisfaction and frustration with computer-based systems used in operational transactions. ACCtrav was one of the systems. Of those surveyed, 78.1% indicated frustration with ACCtrav, and then, followed by communication difficulties (64.8%) among teams due to ever-changing user roles. Some of the factors highlighted in the survey related to unclear roles, complicated and often-changing workflow structures. Those surveyed also indicated high work pressure, unclear tasks, increasing long working hours, frequent failures and difficulties with the computer-based systems, and lack of proper communication and support within the team structures.

The survey of customers showed that 68.7% were not happy with the service rendered, complaining of not receiving the services on time, and often, not happy

with all the stated requirements. The results also pointed out that the systems often were either very slow or down whenever assistance was sought from consultants.

1.3.2 The service delivery scope

The travel function involves finding and booking affordable travel tickets (plane, ship, bus, and train), hotel accommodation, conference venues and organising transfers as required by the customer. Also included are managing the day-to-day operation of the travel programme, safety and security, travel and expense (T&E) data management, and negotiations with all suppliers (airline, bus service, railway service, hotel accommodation and others). T&E is not only limited to travel but include all costs incurred during travel, such as meals, taxi fares, gratuities, gifts, supplies (office supplies and/or services). Also included are conferences expenses, credit card and overall travel data management.

1.3.3 The ACCtrav system

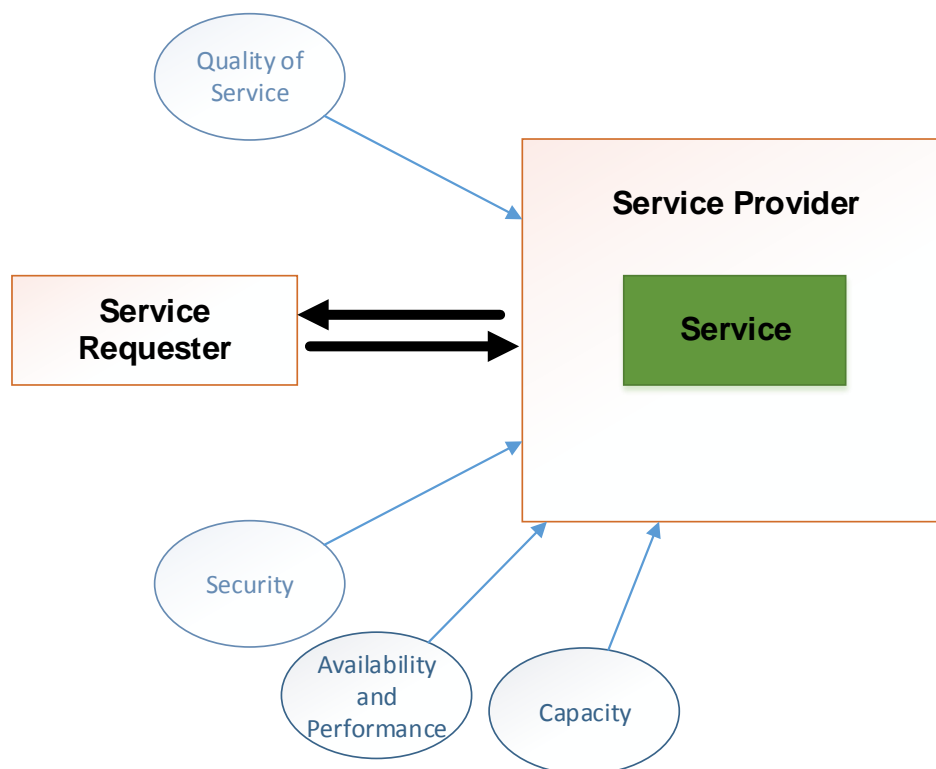


Figure 1: ACCtrav - service system functionality

The ACCtrav system was implemented in the year 2006 to help control travel data quality and travel expense reporting. This was to be achieved through efficient data

capturing, processing, and streamlined workflows. ACCtrav functionality was also aligned in a way that will help speed up service provision, broaden service capacity, and provide for high service availability and performance as well as better security through efficient transaction auditing (see figure 1).

In order to provide customers with actual T&E reports on time and in the format required, some of the manual processes and tasks were automated in ACCtrav. Tasks such as invoicing and voucher creation, automatic fee reconciliation, invoice allocation (see figure 2) were among those automated.

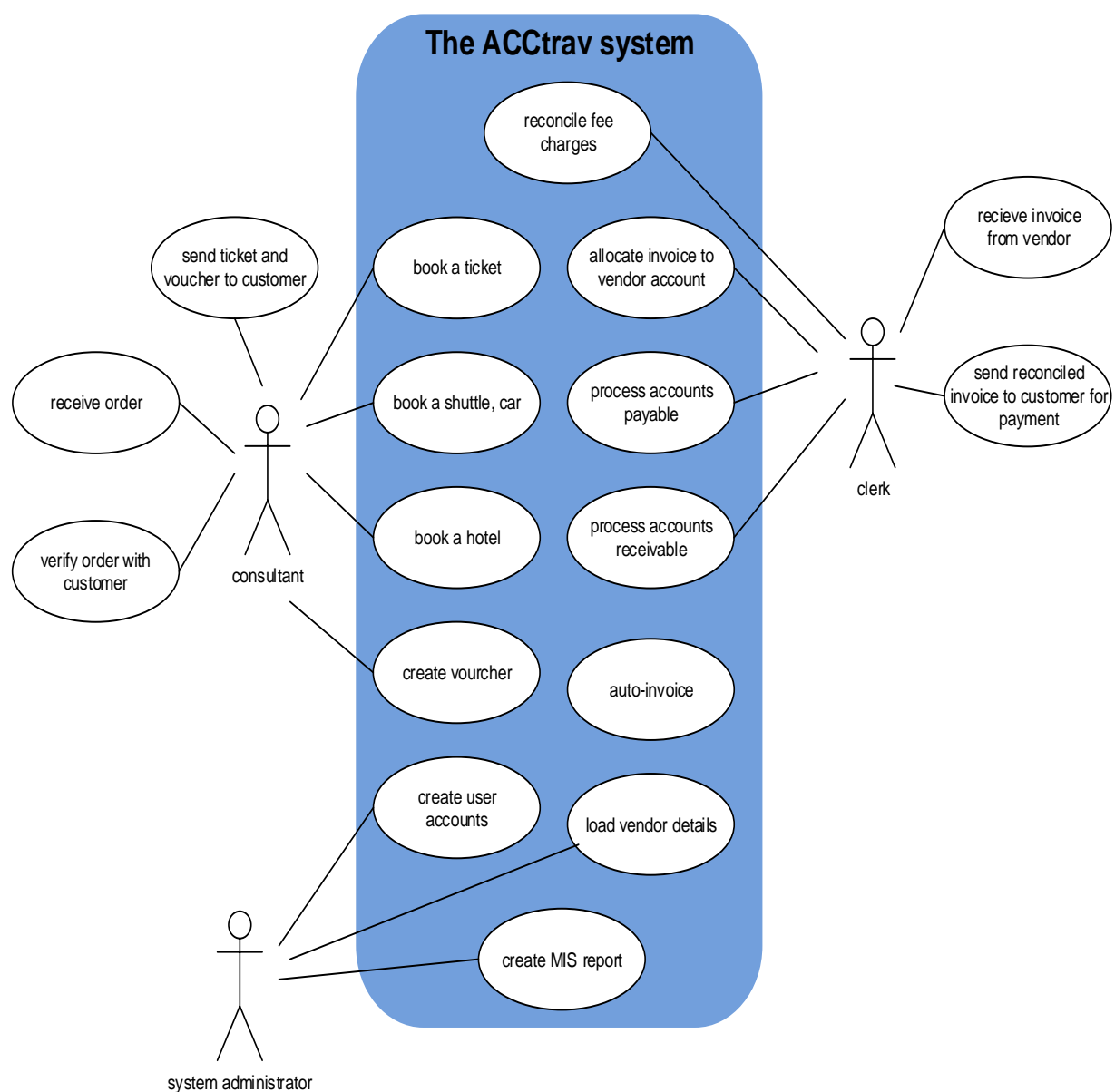


Figure 2: Synopsis of automated tasks in the ACCtrav system

All other records of every travel order request [transaction] would be tracked better from inception to delivery. The transaction process was conducted in the order of receiving travel order through emails or by phone, verification and confirmation of order details, notification of ticket time limits, and issuing tickets (see figure 3).

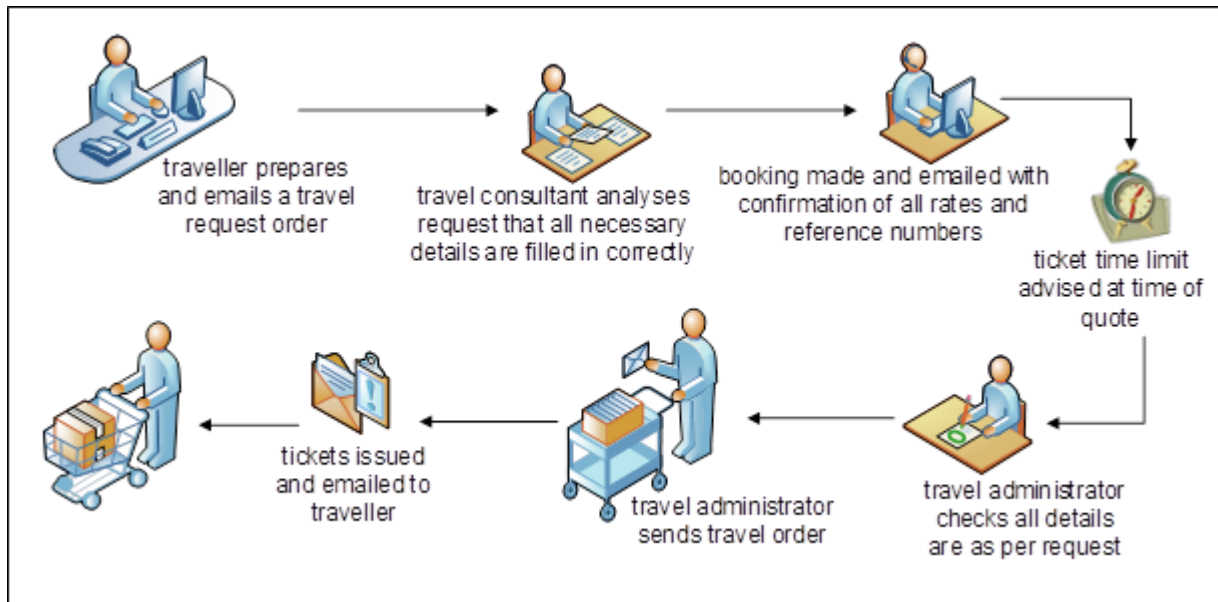


Figure 3: Steps taken during the ticket reservation process

The manual processing of data had posed many challenges that included inconsistencies in data, lost data due to human error as well as prevalent fraudulent activities. Figure 4 shows the ACCtrav system interaction layout across functions. Appendix C covers details about systems and processes. Data collected and stored in the ACCtrav database served as a source of business intelligence because of accuracy in stored transactional details. Business intelligence data was used in understanding customers' preferences and characteristics. The ACCtrav system would help minimise transaction-related risks and improve on managing real-time transactions. Moreover, ACCtrav would, among others, help to improve on the employees' productivity as well as their working environment; manage dynamic customer requirements; detect fraudulent activities; and improve on accountability, reporting and business forecast.

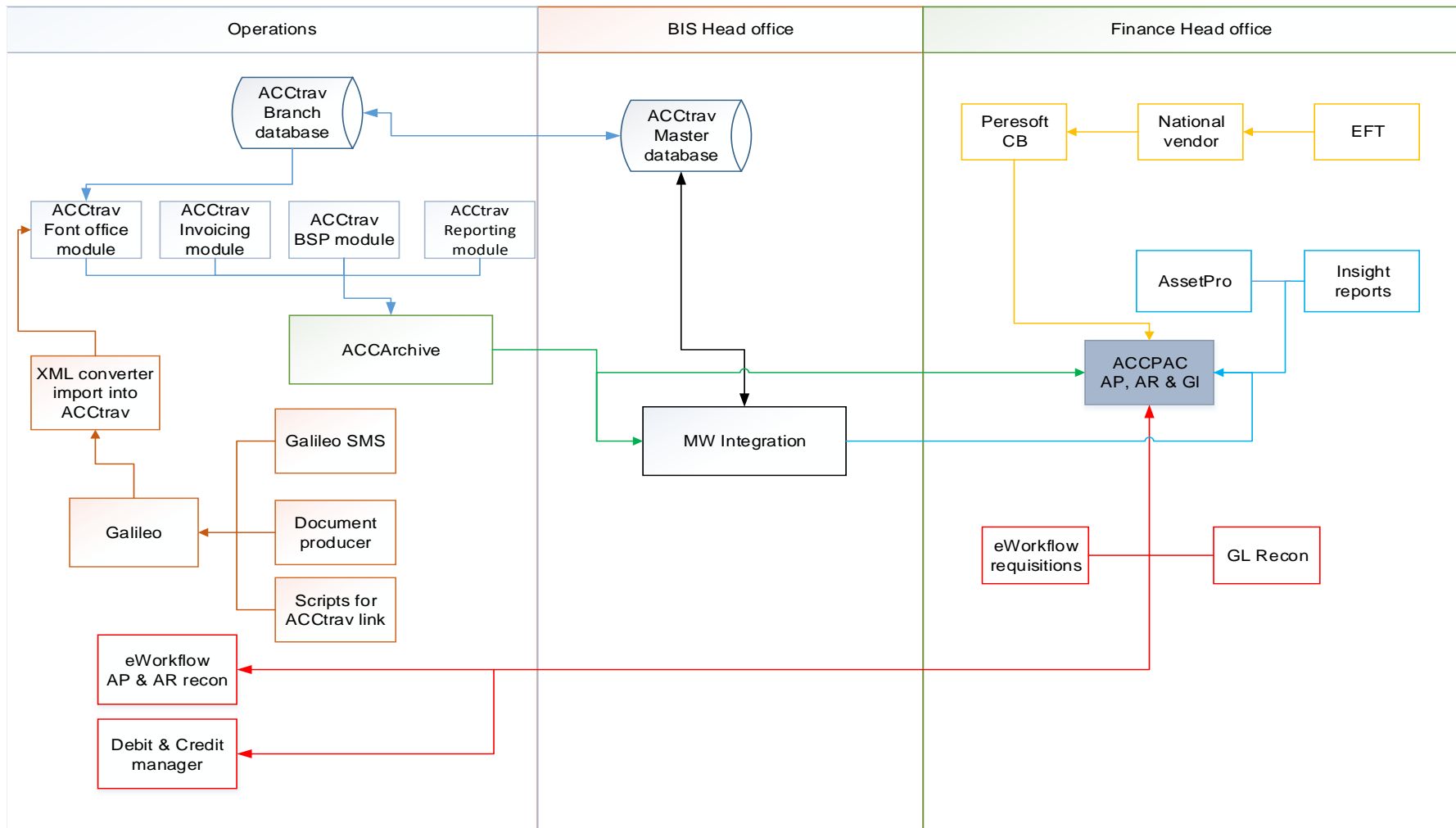


Figure 4: Overview of the ACCtrav system interaction layout across functions

1.3.4 Transitioning to the Logiwiz system

Logiwiz was scheduled to replace ACCtrav during 2010. Logiwiz, regarded as an improved version of ACCtrav, was developed in view of streamlining and integrating business processes at the front-end and back-end of service fulfilment. There were also a set of diverse requirements from operations, marketing, finance and management divisions that had been considered and merged to streamline the processes and the easy tracking of transactions at all times. This would result in total operational and transactional transparency.

The Logiwiz system was designed to run on a thin-client-terminal server computing environment that is accessed through Remote Desktop Services on Windows Server 2008 platform. Users would then access applications and data on a remote server over a network, using the Remote Desktop Protocol (RDP). The Logiwiz system had also marked the advent of cloud computing. All other applications (e.g. emails, internet; in fact, the entire desktop of the computer running terminal services) were made accessible through a remote client machine. Only the user interface of an application was presented on the client machine, and any input to it was redirected over the network to the server, where all application execution took place.

However, by the end of this study, the Logiwiz project had only reached the user acceptance testing phase after four (4) years in development. The results of user acceptance testing indicated possible usability flaws. By this time, the business was faced with bad publicity (business image) challenges both internally and externally. TMC had lost some of the existing contracts with customers. In the period 2011/2012, TMC successfully won three out of twenty-six tenders bid for.

The Logiwiz system will not be discussed again in the rest of the dissertation as it was not the subject of this study. It was added for completeness' sake and not the main basis of this study.

1.3.5 Identifying and articulating the problem statement

Nowadays, travel services employ computer-based systems (ACCtrav/Logiwiz) and organisational networks (as a subsidiary of a group of companies) with the intention

of allowing relatively inexperienced people to perform highly sophisticated tasks quickly, i.e. pushing them over the normal learning curve delays (Quinn and Paquette, 1990; Squires and Preece, 1999; Tractinsky, 2012; Trischler, 1996). Ideally, enabling both TMC employees and customers (often through self-service) to easily deliver on various aspects should be one of the results from well-designed service systems (Lund, 1997; Magoulas and Chen, 2006; Shneiderman and Plaisant, 2005).

The ACCtrav system user interface seemed simplistically designed and structured to achieve the goal of allowing both novice and expert users to quickly perform highly sophisticated tasks. However, users still encountered difficulties to complete tasks and to deliver on set goals. Often, some data captured did not match customer and vendor (supplier) requirements. Some users resorted to manual capturing of data and steps such as creating vouchers and issuing invoices were often missed in the process. The ACCtrav user interface was designed in such a way most menus were prefilled with default data about customers and vendors. It was designed with novice users in mind. However, both novice and experienced users (using the system for many years) complained about difficulties working with ACCtrav. There was also a significant lack of enthusiasm among the users. The Logiwiz system displayed similar problems during the testing phase.

The above observation goes against Quinn and Paquette's (1990, p.1) statement "properly designed service technology systems allow relatively inexperienced people to perform very sophisticated tasks quickly — vaulting them over normal learning curve delays". Quinn and Paquette (1990, p.1) went on to observe: "by constant updating, the successful technologies and systems automatically capture the highest potential experience curve benefits available in the entire system".

The researcher acknowledges that Quinn and Paquette's (1990) observation above is still applicable and relevant for today's technologies, especially where service providers depend on part-time, novice, or relatively inexperienced staff to meet customer requirements. This would be achieved by allowing a user of such systems to take advantage of the business' growing capabilities, which they could not learn directly or be trained individually to execute. Users remain the key component of a

system's successful use (Magoulas and Chen, 2006; Mentis and Gay, 2003; Murrell and Sprinkle, 1993).

The problem statement for this study would therefore be stated as: Inadequate use of HCI interventions in the development process of computer-based systems by TMCs leads to limited business benefits that would have been derived from implementing such systems. The next section will discuss how the research topic was derived.

1.4 Deriving the research topic

The success of any product's use is dependent upon people – its users (Preece et al., 2011; Chamorro-Koc et al., 2009). Should the product not meet the user's daily needs or be perceived with less functionality, challenges arise (NN/g, 2013) and the system's own existence will be challenged. From a business perspective, automating processes and/or tasks does not necessarily bring about system effectiveness. It can instead be a factor in exacerbating the existing problems.

1.4.1 Research topic

In deriving a research topic, the first step was to review available literature on HCI processes and methodologies and their related benefits. The attention was on user productivity, process improvement, change management, task management, self-learning (skills training and development) at lower costs, maximising revenues, attraction and keeping loyal customers, public relations (company publicity – both internal and external), and or improved branding. The problem statement for this study has been stated as “Inadequate or the lack thereof using HCI interventions in the development process of computer-based systems by TMCs leads to limited benefits that would have been derived from implementing such systems.”

The main research question for this study was: *What benefits can a business derive from HCI Interventions?* In order to answer the main research question, the following sub-questions were identified: (1) What were the usability problems faced by the users while accomplishing tasks using the ACCtrav system? (2) How did these usability problems affect business in this case? (3) What HCI techniques could be

applied to correct these usability problems? The answers to the preceding sub-questions provided guidance in providing answers to the main research question. Furthermore, these research questions acted as a guide on the literature review process, and the research design and data collection methods used.

1.5 Dissertation statement

The research process was concerned with the validation, or otherwise, of the following dissertation statement: “Businesses that apply HCI processes and methodologies in the design and development process of computer-based systems reap notable benefits, both tangible and intangible”. This is also applicable to systems already in use.

1.6 Motivation for the study

This was a basic research that sought to explore and improve the understanding of fundamental benefits – both tangible and intangible – that a business such as TMC would derive from employing HCI processes and methodologies. Secondly, the study sought to emphasise existing HCI knowledge, and where possible, to generate new ideas, principles and theories about HCI processes and methodologies. This would be achieved through stimulating new ways of thinking by businesses that have sought or intend to seek guidance from HCI processes and methodologies with the aim of improving on how specialists deal with usability challenges from computer-based systems. As a result, this would help more businesses buy into the idea of understanding and using HCI processes and methodologies and gain from the associated benefits thereof.

1.7 Purpose of the study

The goal of this study was to demonstrate that HCI processes and methodologies and or techniques can help businesses provide a quality service to its customers through improved computer-based systems. The main purpose was to study the impact of HCI processes and methodologies/techniques on:

- User productivity

- Reduction in training costs and skills enhancement
- Redefinition of business processes or workflows that can help generate a competitive advantage
- Improved business operations.

This was done by gaining an understanding of complex issues such as the tasks within the organisation that are automated, communication, implementing change, and publicity when rolling out information systems.

1.8 Significance of the study

HCI processes and methodologies are yet to be widely recognised and accepted as applicable to services and service-related products, and not only to information technology. It was demonstrated in this study that making computer-based systems universally usable can bring about significant improvements at several levels of service operations. The noticeable significant improvements were in areas such as user productivity, reduction in training costs and skills enhancement, redefinition of business processes or workflows that can help generate a competitive advantage, and improved business operations. The study also contributed to the change in perception that HCI processes and methodologies belong in the marketing divisions. The conflict here was eminent and hence the need to distinguish HCI methodologies from marketing processes was important.

1.9 Contributions of the study

The study contributed mainly to knowledge awareness of business benefits related to HCI processes and methodologies. This was done through identification of variables that are critical for business success and on which HCI processes and methodologies have had a positive effect. For example, the principle of learnability emphasises improving users' skills and knowledge. Some other areas of contribution included user satisfaction and wellness; efficient publicity starts within the business settings; skills enhancement comes in the light of learnable and easy-to-use systems, goals, rewards and bonuses. They also included improved communication, comprehending end-users and the performance of tasks, comprehending better

business processes, complying with statutory regulations and acts, and supporting marketing and sales activities.

1.10 The research design and methodology

The study involved a case study. A case study is “an empirical inquiry that investigates a contemporary phenomenon within its real life context using multiple sources of evidence” (Noor, 2008, p. 1602). The evidence used in a case study is typically qualitative in nature and focus, developing an in-depth rather than broad, generalizable understanding (Yin, 1984). In this study, the ACCtrav system was explored, described, and explained exhaustively within its natural setting.

Data was collected using the following methods: interviews, observation, and a questionnaire. Information gathered by these methods provided for triangulation. Observational and interview data complemented that which was collected in the questionnaire for either as verification or to reveal some unexpected ways of use (Dix et al., 2004; Nielsen, 1993) while interacting with the ACCtrav system.

Data collected was analysed as follows: the data collected from the standard QUIS was first grouped into several profiles of interest (see Chapter 5). Profiles were produced by calculating the modes, means and standard deviations for each item in the QUIS. The means were then plotted on a graph using a scale of one (1) to nine (9). The midpoint (5) on the rating scale was used as a benchmark of showing the deviations above and below the criterion. An item above five (5) was perceived to be better than an arbitrary, mediocre value. Data from interview and observation notes was analysed for pattern identification. Data from notes was treated as secondary.

1.11 Assumptions of the study

- Principles of usability and accessibility for web-based applications are applicable to desktop applications.
- Knowledge of reality is influenced by social networks, including language and shared meaning. The same influence applies to workplaces too.
- Business agreeing to implement and make use of HCI processes and methodologies will commit as they would have done without this study. The

implementation in other businesses in the service industry, which are not part of the research project, will be done in the same way.

1.12 The scope and limitations of the study

This study was restricted to the evaluation of tasks (front-end and back-end) in the ACCtrav system. The study examined how the execution of these tasks affected the user, and in turn, how the users' reactions impact on business.

The scope of the study included productivity, skills, communication among users and within the business, and customer relations as in service delivery. Other considerations included product branding and public relations.

Usability was a means of relating the linkage of low business activities (user tasks) to the overall image of the business in terms of providing a quality service. The results from this study can never be generalised or imposed to mean the reality of other related businesses or the service industry as a whole.

1.13 Implications of the study

The implications of this study could lead to:

- Better design of user tasks for these types of business systems and other systems as well.
- Improved learning of similar systems – both cognitive and collaborative. As a result of clear user tasks, users tend to learn quickly and easily share experiences and knowledge. This would have a direct impact on end-user productivity and skills improvement.
- Efficient change implementation in the case where users do not resist but embrace new computer-based systems.
- Efficient organisational branding through the system interfaces (layout, error message display, help, navigation, and task execution). For example, use of business logos and colours in the design of interfaces may create or enhance a sense of belonging in the end-user's mind.

1.14 The outline of the remainder of the dissertation

Table 1: Dissertation layout

Chapter	Content
Introduction and Overview	Chapter 1 outlines the background to the main fields of study in this dissertation. The aspects covered in the chapter included the research problem (ACCtrav), the research questions, the study objectives, research methodology, the significance of the study, and delimitations and limitations.
Literature Review	<p>Chapter 2 provides a comprehensive literature review on HCI. The aspects discussed included the usability and accessibility of systems, and the associated quantifiable benefits to businesses.</p> <p>Chapter 3 continues the literature review but with a specific focus on the relationship between HCI and service systems, which included explaining the principle of services science; the meaning of services; services science; the dimensions of services and the role HCI processes and methodologies have played in the service systems.</p>
Research design and methodology	Chapter 4 describes in detail the research design, data collection methods applied as well as data presentation and data analysis procedures followed.
Data Analysis and Interpretation	Chapter 5 focuses on the interpretation of the data and covers the discussion of the research results with respect to the research questions.
Summary and Further Research suggestions	In Chapter 6, the findings from the research are summarised and conclusions drawn. The contribution of the study is explained herein, followed by a brief discussion on the limitations of this study. Finally, suggestions for future research opportunities are given.

1.15 Summary

This chapter served as the introduction into this study and provided the background to the research as well as covered the motivation of embarking on this study. The aspects covered in this chapter included how the idea for the study arose, the deriving of the research topic from the preliminary literature review, and the identification and articulation of the problem statement.

The research question as well as the dissertation statement, assumptions and limitations of the study, and the layout of the dissertation were discussed.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Nowadays, users expect computer-based products or systems (be it cell-phones, websites, application systems) to just work and be usable and intuitive after undergoing minimal training. Further, modern-day users want more from a system than merely “ease of use” (Carroll, 2013). This may suggest that users have got to either gain immediate value from products or move on, which has created user attitude of either win or lose state based on the premise of user experience.

Studies have shown that the quality of user experience can be directly linked to the success of any business (Bias and Mayhew, 2005; Karat, 1990; Landauer, 1996; Nielsen, 1993). This is because, nowadays, typical business system users have various choices to make. Additionally, users can evaluate alternative solutions to satisfy their expectations and or needs before committing any money. This notion may be relevant to software development houses producing Commercial-Off-The-Shelf Software (COTS) products. This could be because the open market is driven by the competition based on the product’s quality and price.

In-house developed products that are not exposed to the open market affect businesses differently because the employees of the company are the only users of these systems. The majority of the employees normally do not have influence, let alone making choices, on the implementation of company systems. The premise of user choice for in-house developed products can be limited, if not non-existent. These users work with whatever they find within the company. They have to improvise, be creative or manipulative in order to deliver on set goals, and they are expected to deliver irrespective of the system’s usability state (Bessie`re et al., 2004; Lazar et al., 2005). As a result of the environment in which they find themselves working, these users are influenced at every stage by their own experiences – whether good or bad.

HCI has been defined as the learning of how people design, implement and use interactive computer-based systems, and how computers in turn affect individuals, organisations, and society (Carroll, 2013; Dix et al., 2004; Sharp et al., 2007;

Norman, 1988; Shneiderman and Plaisant, 2009). In particular, HCI, as a field, has been related to the study of how humans interact with computers, and how to design computer systems that are easy, quick and productive for humans to use (Sharp et al., 2007). Preece et al. (2011, p.9) defines interaction design as “being about designing interactive products to support the way people work, communicate and interact in their everyday and working lives”.

This chapter investigates the literature on HCI (section 2.2) and its sub-disciplines such as usability and accessibility. In section 2.3 there is a brief discussion on the HCI techniques investigated in this study. The intention was to gain an understanding of the benefits that have been associated with deploying HCI processes and methodologies (section 2.4). Chapter 3 continues with the literature study on Service Science, reviewing the role that HCI processes and methodologies have played.

2.2 Human-Computer Interaction (HCI)

HCI studies have both formed rich academic viewpoints in their efforts to bring about an understanding of interaction with, and through Information System (IS) artefacts (Carroll, 2009; Dowell and Long, 1989; Wild, 2010). These viewpoints had a focus on how to represent an individual and/or collective activity in ways that would educate on the design of new IS artefacts and activities (Dowell and Long, 1998). However, the significance of activity representation in HCI was often based on technology under development (Wild et al., 2009b).

HCI processes and methodologies have been developed not only to realise the ease of use of a product or system but also to establish interaction techniques for supporting user tasks, providing efficient access to information, and providing some form of communication (Sharp et al., 2007; Wild et al., 2009b). Included in the context were the input and output devices as well as system user interfaces. Figure 5 considers the interaction techniques that use input and output devices as well as the ways and means in which information is requested or presented to improve on user experience. Other considerations included controlling and monitoring the computer's actions, documentation, training, and the help procedures. In product

development, attention has been given to designing, building, testing, and evaluating user interfaces, and the best practices when building interfaces (Dumas, 2003).

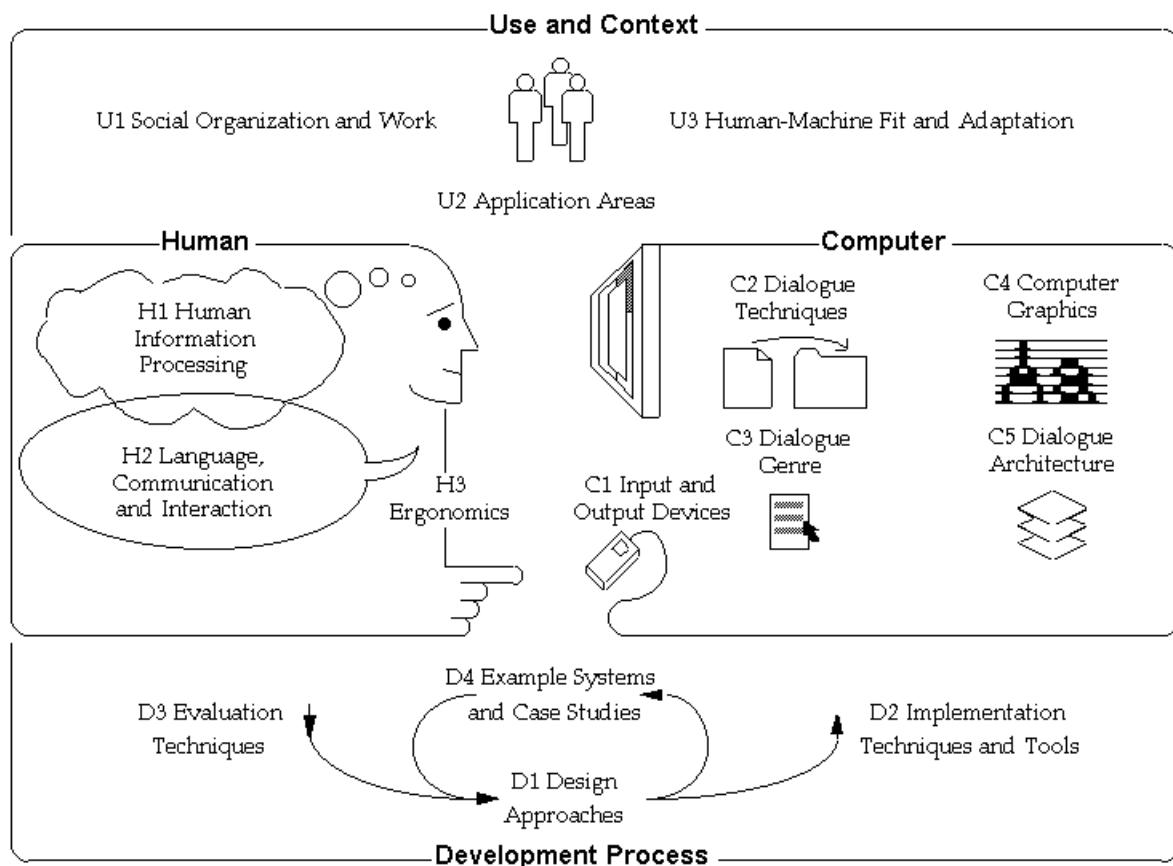


Figure 5: Human-computer interaction (Source: Sigchi, 2009)

The University College London (UCL) approach has been one of the conceptual frameworks put forward for HCI (Dowell and Long, 1989). The UCL approach offered a set of abstractions that put emphasis on effectiveness and performance (Diaper, 2004). The ultimate goal was to have systems that are “effective to use (effectiveness), efficient to use (efficiency), safe to use (safety), having good utility (utility), easy to learn (learnability), and easy to remember how to use (memorability)” (Sharp et al., 2007, p.20). HCI processes and methodologies have been established and divided into several sub-disciplines, including usability and accessibility, which are discussed next in the subsequent sections.

2.2.1 Usability of computer-based systems

Carroll (2013) asserts that usability is an emergent quality that reflects the grasp and the reach of HCI. When it comes to products or systems, usability is regarded as a prerequisite for its usefulness (Nielsen, 1993). The formal definition of usability as provided by ISO (9241-11:1998, p.1) is “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”. NN/g (2013) defines usability by five quality components: learnability, efficiency, memorability, errors, and satisfaction. Usability therefore is “the extent to which the product can be used by specific users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specific context of use” (NN/g, 2013, p.1).

Usability considers multidimensional properties of the user interface, in combination with factors that include the ease of learning, the efficiency of use, memorability, error frequency and severity, and subjective satisfaction (cf. Sharp et al., 2007; Usability.gov, 2012). Usability measures the quality of a user’s experience when interacting with a product or system – whether a website, a software application, mobile technology, or any user-operated device. Usability can also be associated with the functional abilities of the product (cf. ISO 9241-11:1998) in addition to merely being a characteristic of the user interface. When assessing user interfaces for usability, the factors to consider include the fitness for purpose (utility and effectiveness) and the work or time required to use (efficiency) (cf. Sharp et al., 2007, p.20). These factors are subjectively measured against the criteria, sometimes referred to as the principles of user interface design – that is visibility, feedback, constraints, consistency, and affordances (Norman, 1988) – and the result is often expressed quantitatively as a numeric score or percentage.

Dumas (2003) stated that one of the primary goals of usability testing/evaluation is to improve the usability of a product. In each usability test conducted, there could be more specific goals that may range from comparison with competitors’ products, ease of use, learnability, efficiency of systems, and other goals. Bias and Mayhew (2005) further stated that usability could be used to gain business benefits. The benefits could range from cutting costs, skills enhancement or retention, customer

satisfaction, to increased ROI of the ICT infrastructure. De Villiers (2009) emphasised that usability testing technology may also be used to find out more about the actual behaviours of users interacting with the systems. The usability of a product is not only affected by its features but also by the characteristics of the intended users; the tasks carried out; and the technical, organisational and physical environment in which the product is used (Wild et al., 2009a). This study took a similar view as that of Bias and Mayhew, and De Villiers.

From a business analysis (BA) perspective, usability is regarded a non-functional requirement of systems. Non-functional requirements are quantified by stating the system attributes (e.g. security access levels, meantime before failure) or indirect measures. BA practitioners can use usability techniques in conjunction with process analysis techniques to address some aspects in system process analysis (Andersen, 1999) such as better understanding users of the system. This would include the users' general background, level of knowledge in terms of information processing, learning needs, what users want or need to accomplish and what must be left to the machine in the context of work. Usability concepts and techniques can also be used to analyse business processes with the aim of improving on the performance of business activities (Trischler, 1996) by defining performance measures, and the assessment and performance evaluation.

The characterisation of performance measures (e.g. the time it takes to process an application/task, the number of customer complaints) is important both in process analysis and usability evaluation in order to identify or assess opportunities for improvement. For example, the software should help meet the special needs of disabled users (i.e. be accessible) and other stated guidelines to consider when evaluating its design and usability (Dumas, 2003; NN/g, 2013). Therefore, the reasons to justify the value of usability fall within the need to

- know and empower the users;
- design things that look the same to act the same, and those that do not, should act differently;
- presentation of information needed for decision-making;

- design message dialogues that are meaningful to the users, i.e. instruct the user on how to fix the error;
- ensure that every action taken should have a reaction in a way that the user always knows what is happening;
- fix all the mistakes made by the users, if possible, since every user makes mistakes;
- minimise the need for memory by keeping designs simple; and
- make tasks and processes easy and faster since the best journey has fewest steps.

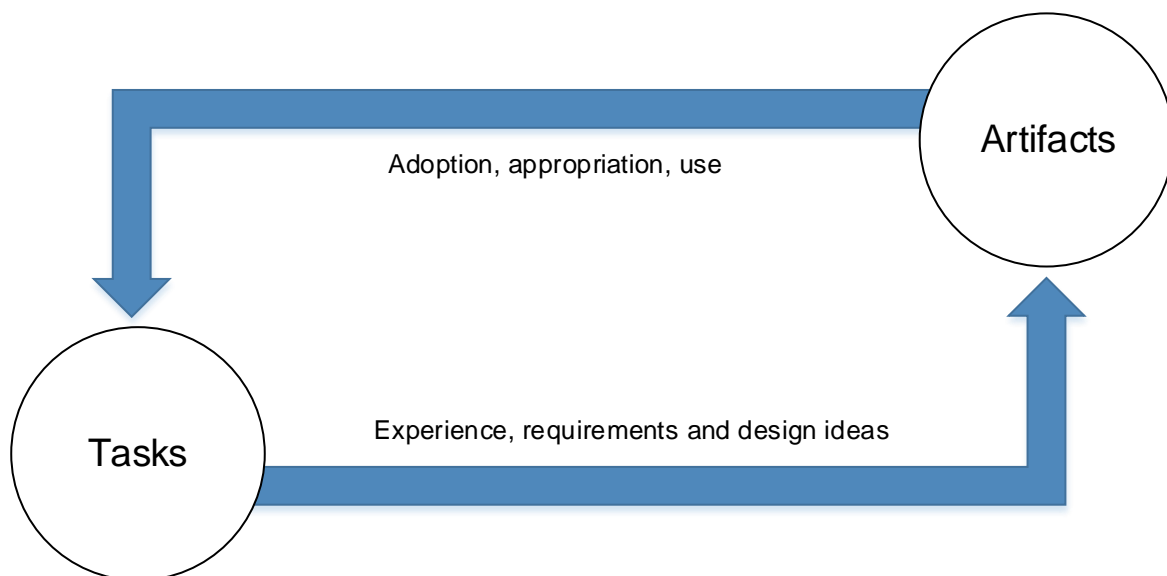


Figure 6: The task-artifact cycle. Human activities implicitly articulate needs, preferences and design visions (**Adapted from:** Carroll, 2013)

Usability can be used in the co-development of the activities that users engage in and experience, and the artefacts – such as interactive tools and settings – that facilitate those activities (Carroll, 2013). Figure 6 shows how usability concerns the evaluation of interactive systems and tasks. The activities that users engage in often articulate the use and experience, preferences, needs, and design expectations. The users have needs because of the requirement to execute the tasks. The users construct artifacts and change artifacts (both system hardware and software) in order to fulfil this need. Artifacts can be designed, in response, through the course of users adopting new designs to provide new possibilities for action and interaction. As a result, users’ preferences, needs, and design ideas become clearer. Moreover, the

concepts and skills develop as users express new requirements. Usability also concerns the understanding of user performances and aspirations; and how the performances and aspirations can be personalised and shared past the limitations of existing infrastructures and tools (Carroll, 2009) in the co-evolution of activity and artifacts. These considerations can be addressed by developers by using appropriate usability evaluation and other appropriate (HCI) techniques (Dumas, 2003).

2.2.2 Making the business case for usability

HCI processes and methodologies are significant to any business that makes use of computer-based systems (Bias and Mayhew, 2005; Heppner et al., 2005). Computer-based systems are developed and implemented to enable business to achieve goals and objectives in an effective way (Heppner et al., 2005).

However, many software projects have often failed because of the lack of understanding of the business goals by the developers and the poor usability of such systems (Boehm and Turner, 2003). In addition, Taylor and Swan (2004) associated the cause of software project failures with the lack of effort spent by the designers of such systems on understanding the way in which humans interact with technology. In explaining the lack of understanding the way in which humans interact with technology, Taylor and Swan (2004) used an analogy of mothers who create a list to organise their daily tasks – which an outsider hardly knows of – leave alone, forgetting the hard work that goes into fulfilling the compiled lists.

The lack of effort from designers in understanding how humans interact with computers has led to the lack in system functionality, and as a result, has led to quality problems. Also, businesses get affected in the form of high costs in maintaining such systems (Bias and Mayhew, 2005). It is appropriate to make use of HCI processes and methodologies to improve on business understanding about how humans relate emotionally to technology whilst using systems to accomplish everyday tasks (Carroll, 2013; NN/g, 2013; Preece et al., 2011).

Computer systems that are well designed and usable may not require to check whether or not users can achieve intended tasks at an optimal pace; whether they

need training; are provided with the necessary documentation or other supporting materials to help them; and whether users can easily find solutions in these materials (Lund, 1997; Magoulas and Chen, 2006; Shneiderman and Plaisant, 2005).

2.2.3 Accessibility

Accessibility is related to and sometimes regarded a complementary component of usability. Accessibility is considered to be the extent to which an application is perceivable, operable, and understandable by people with different abilities (Alexander, 2006; Henry, 2002; Pernice and Nielsen, 2001). Direct accessibility is provided for when an application has built-in redundancies that enable access by people with mild to moderate disabilities without system modifications. On the other hand, indirect accessibility provides access through add-on assistive technologies (Vanderheiden, 1994).

The universal design strategy has been one of the approaches used to facilitate the development of applications that are both usable and accessible (Lazar, 2007). Universal design is also the process of designing products, systems or applications that can be used by a wide variety of people in as many circumstances as possible (Darzentas and Miesenberger, 2005; Dix et al., 2004). Universal design has aimed at providing equitable experiences for everybody; this, in essence, makes it possible for more people to benefit from improved usability. However, the usability issues for users with disabilities may be different from those without disabilities. Differentiating between users with and without disabilities in a workplace may be a challenge because it is likely that all users may have at some point experienced some form of disability. The difference may lie in the degree of severity. According to NN/g (2012), most users at age 45 and over need resizable fonts although they are not regarded as “low-vision” users. Senior citizens’ usability issues are different from those of young users with disabilities, but again, there are many similarities between the two groups.

The business goal of accessibility would be to get more workplace productivity from users with disabilities. This is similar to the goals of usability. Applying a combination of accessibility and usability principles improves user experience (UX). UX refers to a user’s sentiments about using a specific system or product by highlighting the

practical, emotional, meaningful and valuable characteristics of human-computer interaction as well as a user's perceptions of the applied aspects, such as the system utility, ease of use and efficiency (NN/g, 2013; Preece et al., 2011).

2.3 HCI techniques investigated

There are several HCI processes as well as techniques that have been developed and adopted for various use within the field of HCI. Many of these techniques can be triangulated when investigating a specific case of interest. However, many of these HCI techniques were not investigated in this study except for those considered to be the most suitable for this study's goal of (a) improving user productivity; (b) reducing the costs of training; (c) enhancing skills among users; (d) redefining business processes or work flows to generate a competitive advantage; and (e) improving business operations (Bias and Mayhew, 2005; Magoulas and Chen, 2006). The HCI techniques that were investigated in this study are Contextual Inquiry and Task Analysis, Attention and Workload Mode, Human Information Processing Model, the User-Centred Design (UCD), Goals, Operators, Methods, and Selection Rules (GOMS), Cognitive Walk-through and Heuristic Evaluation or Usability Audit. The reasons and explanation to justify why these techniques were chosen and investigated can be found in Chapter 6 section 6.4.3

2.4 The benefits of HCI processes and methodologies

Practitioners rarely use the recommended usability methods on software development projects (Whiteside et al., 1988; Nielsen, 1993). This includes even such basic usability engineering techniques as early focus on the user, empirical measurement, and iterative design. Gould and Lewis (1985) found that only 16% of developers mentioned all the three principles when asked what one should do when developing and evaluating a new computer system for end-users. Mantei and Teorey (1988) stated that one of the imperative reasons usability engineering was not used in practice relates to the perceived cost of using the techniques. Software development houses have often viewed usability methods as expensive, and the costs incurred to add human-factor elements to the development of software seem to make the project costs higher (Mantei and Teorey, 1988). However, the researcher

acknowledges that the findings of these studies (Gould and Lewis, 1985; Mantei and Teorey, 1988; Nielsen, 1993; Whiteside et al., 1988) may be out of date.

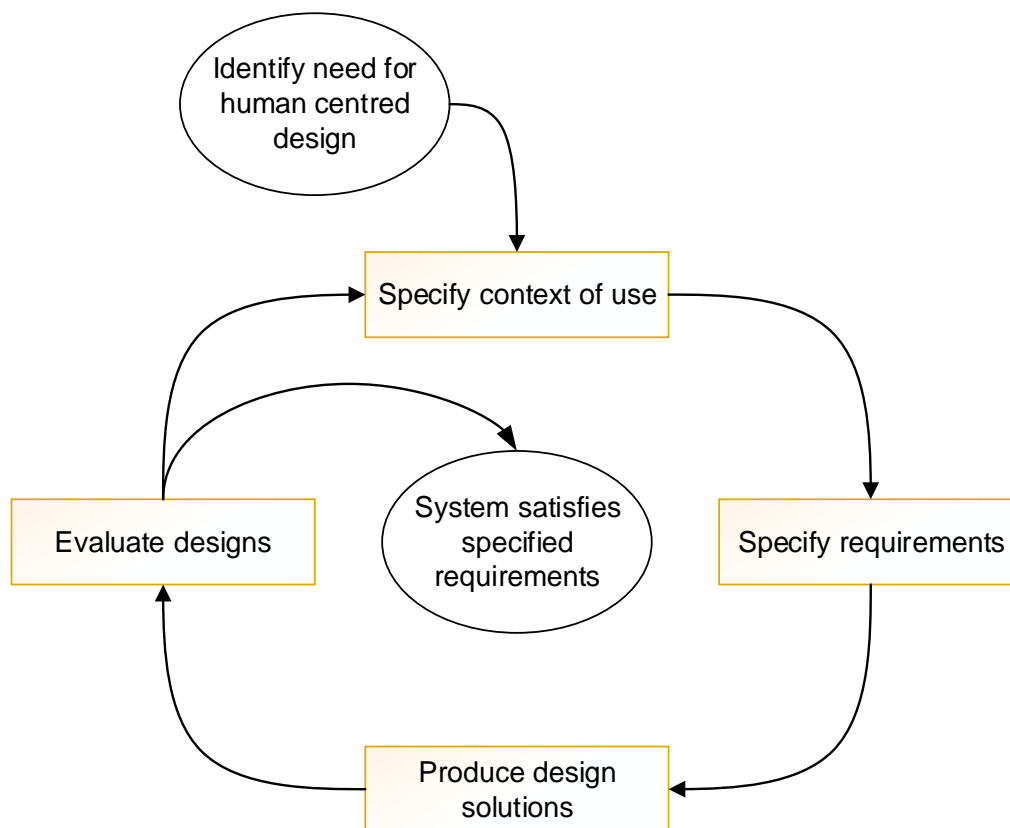


Figure 7: The User-Centred Design model (Adapted from: ISO, 2010)

In the recent past, a number of studies have developed design principles for improving and justifying the deployment of HCI processes and methodologies (Bias and Mayhew, 2005; Landauer, 1996). As a result, one common process is now known as user-centred design (UCD). Figure 7 shows a UCD model (cf. ISO 9241-210:2010: Human-centred design process for interactive systems) that defines a generic process comprising user-focussed activities throughout a development life cycle. The model identifies four process activities that form the main cycle of work. The “specify the context of use” activity identifies the users of the system, its purpose, and the environment in which the system will be used. The “specify requirements” activity involves identifying any business requirements or user goals that the system will meet to be regarded as successful. The other two activities – create design solutions and evaluate design solutions – involve building the rough concept to a complete design; usability testing with the users form an integral plan

for quality testing. UCD has also been used to provide a valuable contribution when conveying a usability plan. The process can also be used to compare different usability methods and so aid in the selection of the most cost-effective method for the project (Bias and Mayhew, 2005; Carroll, 2013; ISO, 2010).

Businesses and practitioners are yet to fully embrace HCI methods and processes, and to get out of the narrow-mindedness and misunderstanding of HCI. Karat (1990) prepared a cost-benefit analysis that submitted that a venture in usability engineering can create an ROI in the series of 3:1 to 100:1 (see figure 8). The payoffs included fewer last-minute design changes; usable, appealing, and effective designs; simple, less costly documentation; credible marketing claims; compelling product demonstrations; increased sales; reduced need for customer support; and longer market life.

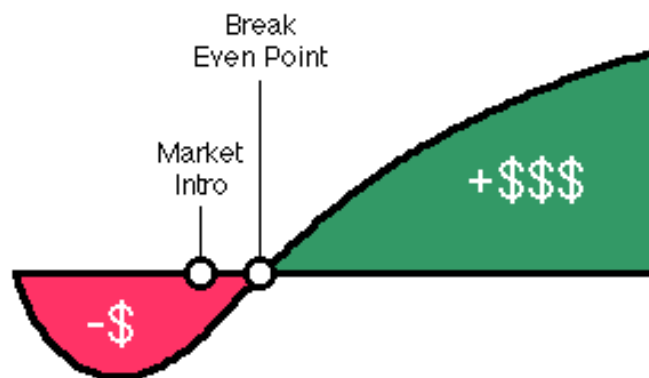


Figure 8: Cost-Benefit Analysis of usability engineering techniques (Source: Karat, 1990)

Myers (1992) found out that users expect highly effective and easy-to-learn interfaces. The human-computer interface is critical to the success of systems in the workplace as well as the safety, usefulness, and pleasure of using the system (Lindgaard and Dudek, 2002). Hence, over 50% of the design and programming effort on software projects should be devoted to the user interface (Carroll, 2013; Preece et al., 2011).

There is empirical evidence that employing the HCI processes, techniques, and tools can, with much worth, decrease costs and increase user productivity (Donoghue, 2002; Mele and Polese, 2011). For example, Nielsen (1993) cited a study by Karat

(1990, p.1) stating savings “as a result of applying usability engineering techniques of about \$41,700 in a small application used by 23,000 marketing personnel, and approximately \$6,800,000 for an application used by 240,000 employees”. “The benefits were realised in reduced task time, fewer errors, reduced user interruption, reduced load on support staff, riddance of training, and averting of modifications in software after release”.

Mantei and Teorey (1988) estimated the mean benefit for finding each usability problem at \$19 300. Nielsen’s (1993) mathematical model based on eleven studies suggested that using software that has undergone usability engineering could save a small project \$39 000; a medium project \$613 000; and a large project \$8 200 000. The benefits of usability engineering can be up to 5 000 times the cost (Nielsen, 1993).

HCI processes and methodologies, when applied, can offer decreased costs of system design and development. System development timelines can be shortened, and there can be a decreased risk of project slippage. There is also an element of increase in competitive edge since users will have a system that is easy to use. Users become more satisfied when a system offers relevant services that match their needs and expectations, leading to success in the workplace when implementing change.

2.5 Conclusion

HCI processes and methodologies in one way or the other can be used to complement process analysis. This can be through learning how computer-based systems affect users’ way of work, and communication and interaction in their everyday working lives. The understanding would bring about benefits for business, which may be reflected in higher revenues through increased sales; increased user efficiency and satisfaction; reduced development costs; and reduced support costs.

HCI processes and methodologies may also be used to develop and implement business systems easily or adjust in ways that could help achieve specific goals with effectiveness, efficiency, and satisfaction.

CHAPTER 3: THE RELATIONSHIP BETWEEN HCI AND SERVICE SYSTEMS

3.1 Introduction

This chapter continues with the literature review started in Chapter 2, specifically, considering the role of HCI processes and methodologies within service systems. Service systems have been defined as “dynamic configurations of people, technologies, organisations and shared information that create and deliver value to clients, providers and other stakeholders” (IfM and IBM, 2008, p.1). The operations in the services sector have subjective performance measurements, and there have been expressions from scholars for the need to gain a deeper understanding of the practical use of computer-based systems in service-based organisations (Hocova and Stanicek, 2010; Maglio et al., 2006; Spohrer et al., 2007). Furthermore, there is still a need for a performance measurement system designed specifically for a service-dominant context (Spohrer and Maglio, 2008). As a result, the term Service Science has emerged, which, according to Kim (2009, p.3) “is the study of service systems with the view to discover the underlying principles that can inform service innovation and guide the design, improvement, and scaling of service systems”.

The use of HCI processes and methodologies can be essential and complement Service Science when highlighting the relationships between the enterprise’s computer-based systems and the business’ strategic goals, especially when developing the measurement models and key performance indicators to assess the quality of service provision (Spohrer and Maglio, 2008; Rust and Miu, 2006). HCI processes and methodologies can be applied together with Service Science since both have an influence on the design of computer-based systems and emphasise the merging of technology with an understanding of the business processes, with a perspective on customers, internal relationships and communication.

The chapter begins with a discussion on the background of services in section 3.2, where service characteristics, service models, and service systems were also briefly discussed. The researcher sought to explain and link the relationship between HCI and service systems in section 3.3, whereas section 3.4 focuses on the role of HCI

methodologies in service systems. This included a discussion of user-centred design, business and user values, performance influencing factors, culture, social factors, as well as frustrating user experiences. Section 3.5 contains a summary of this chapter.

3.2 The services

Services have been described as a particular transformation brought about in the condition of some person or good, with the agreement of the person concerned or economic unit owning the good (Hill, 1977). As a result, service can then be considered as “the application of competences for the benefit of another” (Spohrer et al., 2007, p.72), implying that service can be a performance, action, or an undertaking traded for value between the client and provider.

Many studies have stated the definition of services, stressing the intangible, events and the partaking nature of services (Lovelock and Gummesson, 2004; Vargo and Lusch, 2004; Wild, 2010). Sampson and Froehle (2006) described services as “an action, performance, or promise that’s exchanged for value between provider and client” (Spohrer et al., 2007, p.74). Services may be viewed as a “mechanism” that enables access to one or more know-hows, where access is granted using a prearranged interface and used consistently with controls and policies stated in the service description (Spohrer et al., 2008). Services can be paraphrased in terms of their generic key characteristics (Darby and Karni, 1973; Hill, 1999; Levitt, 1981; Zeithaml, 1981). The characteristics include perishability, intangibility, inseparability, simultaneity, and variability. Table 2 lists service characteristics and the implications from marketing and positioning strategies (Blankson and Kalafatis, 1999).

In sections 3.2.1 and 3.2.2, the concept of service systems and the service models are discussed.

Table 2: Service characteristics and their implications for marketing and positioning strategies (**Source:** Blankson and Kalafatis, 1999)

Characteristics of services	Marketing implications	Positioning tactics and strategies
Intangibility	Sampling difficulty; Strain on promotional element of marketing mix; No patents possible; Difficult to judge price and quality in advance	Focus on benefits and attributes; Increase tangibility of service; Use brand names; Use personalities to personalise service; Develop a reputation
Inseparability	Requires the presence of producer; Direct sale; Limited scale of operations	Learn to work in larger groups; Work faster; Train more service providers
Heterogeneity	Standard depends on who and when provided; Difficult to assure quality	Careful personnel selection and training; ensure standards are monitored; Pre-package service; Emphasise bespoke features
Perishability	Cannot be stored; Problem with demand fluctuations	Match supply and demand effectively (e.g. reduce price during off-peak)
Ownership	Customer has access to, but not ownership of, service activity or facility	Stress advantages of non-ownership (e.g. permit easier payment system)
Standardisation	Difficulty in consistency of service delivery	Create uniformity; Instil company's ethos in personnel

3.2.1 The concept of service systems

The view of service systems in this study has been taken from the model described in Maglio et al. (2006), which has provided the concept that is often referred to by other Service Science researchers (Hocova and Stanicek, 2010; Spohrer et al., 2007). Figure 9 illustrates the definition of service systems and shows how service systems interact and take upon the roles of either the service provider or service client (Spohrer et al., 2007). In this case, the service provider or service client can be in the form of an individual, an organisation – either public or private – with the service interventions that may include people or business dimensions such as products, technology artefacts, or information sharing. The service provider is responsible for transforming or operating a service in order to create value for the service client (Kim, 2009).

Some scholars have proposed a view of service systems which can be understood as being primarily a cognitive system that depended on its own understanding for survival and performance (Kim, 2009; Mele and Polese, 2011). However, this kind of proposed view of service systems does not clearly state how a service system can understand itself. It can surely not have the consciousness to think about itself. From the perspective of a cognitive system, service systems produce information and stimulate knowledge in a way that creates new knowledge through continuous learning processes (Mele and Polese, 2011). The resources and learning processes in service systems thus may form the basis in processes for value creation (Kim, 2009). Although generating sustainable value for business owners is the ultimate goal, the creation of satisfying, revenue-generating, and or cost-saving user experiences forms the means to an end nowadays (Bias and Mayhew, 2005, p.601).

Service systems have a characteristic of involving users acting in various roles (Maglio et al., 2006; Spohrer et al., 2007). The roles may include: as an originator and consumer of the service; setting the most important intentions for the design and operation of the service; setting quality standards for satisfactory service levels; participant in the process; and source of knowledge to the process (Kaner and Karni, 2006; Kim, 2009; Mele and Polese, 2011). Businesses are still seeking ways to better facilitate these various roles through the use of technologies.

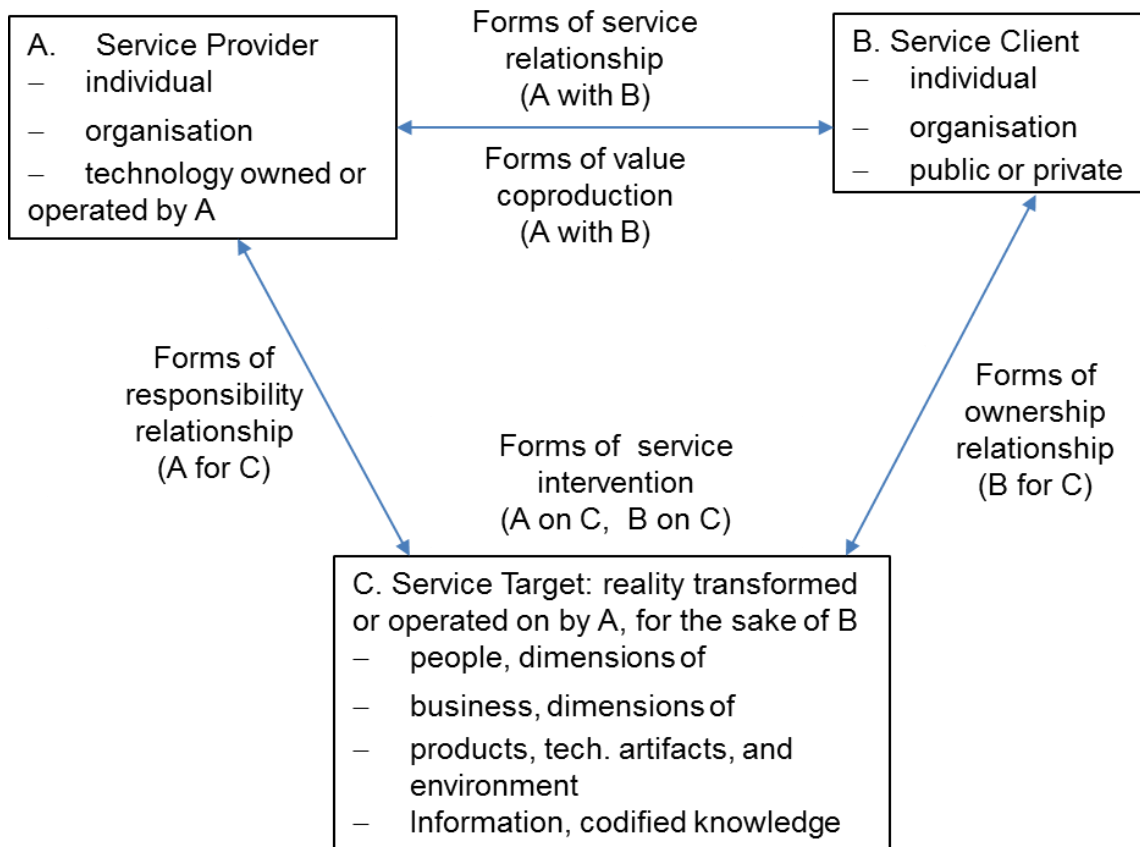


Figure 9: The conceptual model of service systems interacting in a service (**Source:** Maglio et al., 2006)

3.2.2 The service models

Both scholars and businesses have developed service models to outline the upper-level business functions. The upper-level functions are further segmented into services representing the processes and activities needed to accomplish the business interests/goals and manage assets in their various states (Kaner and Karni, 2006; Mele and Polese, 2011). For example, Cai et al. (2008) suggested a so-called service map (see figure 10) organised in three layers according to needs, competencies, and resources.

The service needs are formed from the perspective of providing attractive user experiences, reducing user sacrifices by improving on the service systems availability, and the efficiency of service delivery. The second layer of the map focuses on service competencies targeting the capabilities of a service provider to deliver high quality services to its service clients (Cai et al., 2008). The competencies are grouped into vertical competencies (related to the service process) and

horizontal competencies (related to various stakeholders). The last layer is about resources, which could either be items or assets (i.e. information, people, processes, physical assets) required to raise interaction and value creation.

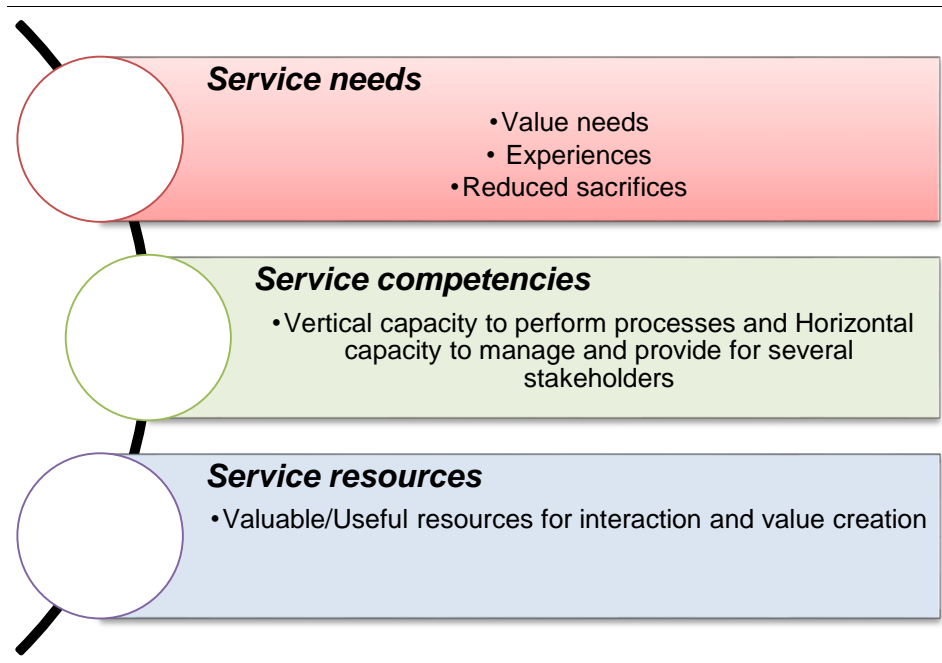


Figure 10: Service map (Adapted from: Cai et al., 2008)

Leveraging service resources, service systems can strengthen their service competencies in order to respond to service needs and increase the value created (Kim, 2009). Some studies have investigated service models from a general management point of view (e.g. Drucker, 1991; Quinn, 1992) and endeavoured to comprehend and transcend the distinction between manufacturing and services. For example, in the Goods-Dominant (G-D) logic aspects, McCarthy (1982) used the Resource-Event-Agent (REA) model when discussing services from an economic exchange perspective – the accounting systems in particular. Also, Spohrer et al. (2008) came up with the ISPAR model to classify and characterise service systems associations – in the form of a decision tree – that aim towards co-creation of value (Maglio et al., 2009). Both the REA and ISPAR models were based on G-D logic where services are viewed as “second-class products” that have shortcomings in the form of inseparability, intangibility, perishability, and heterogeneity (Poels, 2010). Table 2 describes the characteristics of services.

The REA model was further applied and studied based on the aspects of automotive services by Weigand et al. (2009). Poels (2010) investigated the REA model from the Service-Dominant (S-D) Logic perspective, and from it, derived the Resource-Service-System (RSS) model. The RSS model conformed to S-D logic, where services are viewed as a collaborative process in which capabilities are applied for value co-creation. The intention of the RSS model was to help understand difficulties created due to the inherent process inefficiencies when providing services instead of goods. In particular, the RSS model was used to identify resources that contribute in the exchange of reciprocal services by recognising the different states in which certain types of service exchanges could be when monitoring service executions.

The next section discusses the HCI concepts in service systems and how useful these concepts can become in task innovation, design, and execution.

3.3 HCI and service systems

Some scholars have explicitly examined services for a range of computing applications such as web-based, pervasive and ubiquitous, using metaphors such as the Service-Oriented Architectures – SOA, Software as a Service – SaaS (Chen et al., 2009; Cyr et al., 2007; Luthria and Rabhi, 2009). The user value and worth-centred precepts of HCI have also made their way into the service design approaches (Cockton, 2006; Cottam and Leadbeater, 2004; Jones and Samalionis, 2008; Parker and Heapy, 2006; Reason et al., 2009). Wild (2010) stated that HCI and Service Science have a common goal of creating robust, repeatable activities or experiences that can be objectively successful (Papazoglou and Van den Heuvel, 2007; Van Dijk et al., 2007).

The primary tenets of an S-D logic are the conceptualisation of service as a process, rather than a unit of output; a focus on dynamic resources, such as knowledge and skills, rather than static resources, such as natural resources; and an understanding of value as a collaborative process between providers and customers, rather than what producers create and subsequently deliver to customers (Mele et al., 2009). Wild (2010) further suggested that Service Science can benefit from HCI's experience, specifically through (1) the user-centred mind-set and techniques, and (2) concepts and frameworks for understanding how interacting with computer-based

systems may influence the nature of services. However, there is still a need to know more about how service systems advance, improve, and importantly, how they innovate over time. Perhaps an important issue would be how HCI processes and methodologies could be employed to benefit the understanding, advancement and improvement of services. Understanding the benefits of HCI processes and methodologies from a services perspective may also require fundamental ways of thinking about business, which may include scenario development (see figure 11). The scenarios that HCI could best develop are user scenarios based on context perspectives, service scenarios and access technologies (van Schaik and Ling, 2009).

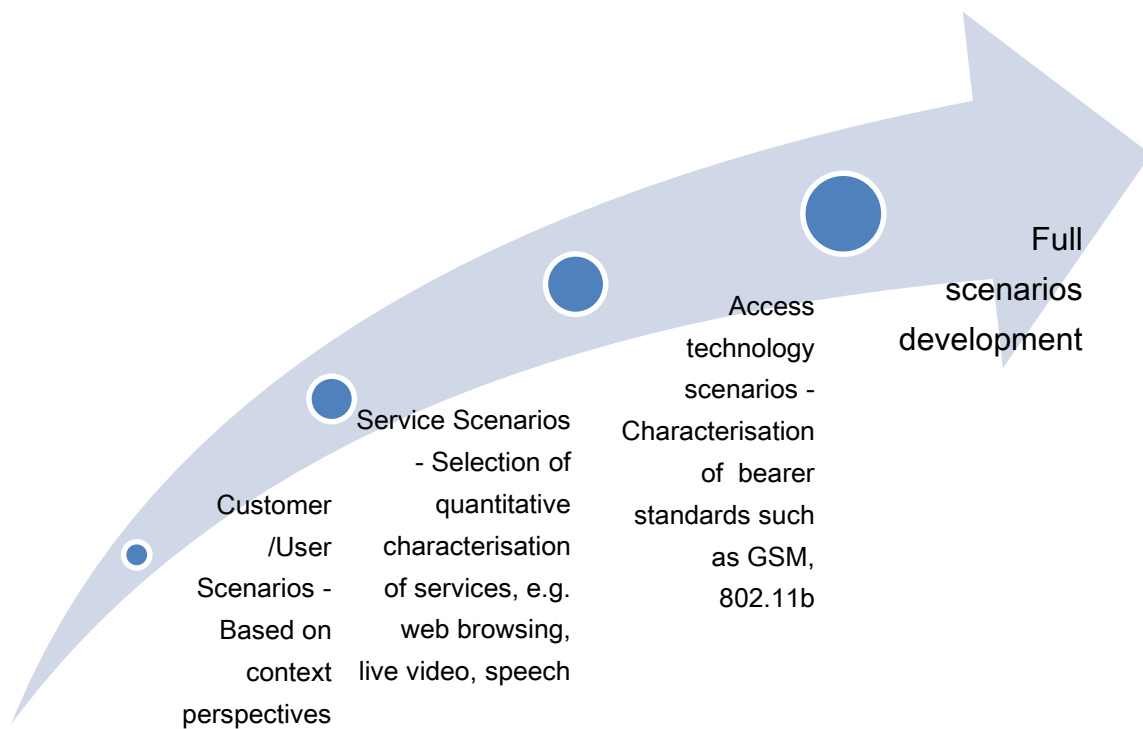


Figure 11: Scenario development

3.4 The role HCI techniques can play in service systems

HCI scholars have been effective in establishing efficient methods of accomplishing tasks and have profoundly transformed computing practices over the years (Bias and Mayhew, 2005; Carroll, 2013). In particular, HCI research has been outstanding in the user experience, participatory, and activity learning approaches for analysing and designing computing applications and activities (McCarthy and Wright, 2004;

Schrepp et al., 2006). Dowell and Long (1989) came up with the UCL conception, which presented a set of HCI constructs that can be applied when dealing with Service Science. The constructs have been used in exploring the influence, scope and utility when relating elements of research and in modelling service systems (Dowell and Long, 1998).

One of the main contributions of HCI research to other fields has been in promoting early focus on users in the process of developing IS artefacts. The user-centred approach is universal enough that it can be applied to activities and experiences when providing a service (Wild, 2010). HCI processes and methodologies can be used to produce both functional and organisational aids when analysing and/or designing services based on the principle of early and repeated focus on users and their tasks or activities (Batt, 2008; Bourges-Waldegg and Scrivener, 1998; Cai et al., 2008). HCI processes and methodologies can also offer strategies such as prototyping, user participation, conceptual design or a choice of approaches that may afford a refined investigation of tasks or activities and their associated consequences in cognitive, social, emotional or informational aspects (Wild, 2010).

HCI processes and methodologies can complement service design methodologies in several aspects. The key aspect can be in the eliciting of user requirements. Whether these requirements are formal or perceived, their evaluations could be based on the level of processing and cognition, and/or the emotion involved or the desired outcomes in the form of attitudes, performance, satisfaction and motivation. Figure 12 shows the framework that Tractinsky (2012) used to study the visual aesthetics in HCI. The framework can be used in studying service systems, especially to understand the features and the perceived attributes of the designed service as well as user behavioural concerns (Batt, 2008). The most interesting sections of the framework would be the outcomes and moderators. For example, that users' perceptions of a system's good looks may influence perceptions of other attributes such as ease of use (Cyr et al., 2006; van der Heijden, 2003), the performance (Quinn and Tran, 2010; Sonderegger and Sauer, 2010), preferences (Lee and Koubek, 2010) as well as the user's overall satisfaction (Cyr, 2008) and their attitudes towards businesses represented by the system (Lindgaard et al., 2011; Tractinsky et al., 2006).

Affect and emotions have been considered as outcomes of visual aesthetics (Thüring and Mahlke, 2007; Tractinsky, 2012) and contributes to a positive user experience and well-being, and subsequent information processing (Sun and Zhang, 2006). HCI processes and methodologies can help in identifying and examining various factors that affect users through potential moderators such as the context of use, and the differences in culture (Hoyer and Stokburger-Sauer, 2011; Tractinsky, 2006).

Sections 3.4.1 to 3.4.6 will discuss some of the specific areas in which HCI interventions have had a recommendable impact, and how the service systems may benefit.

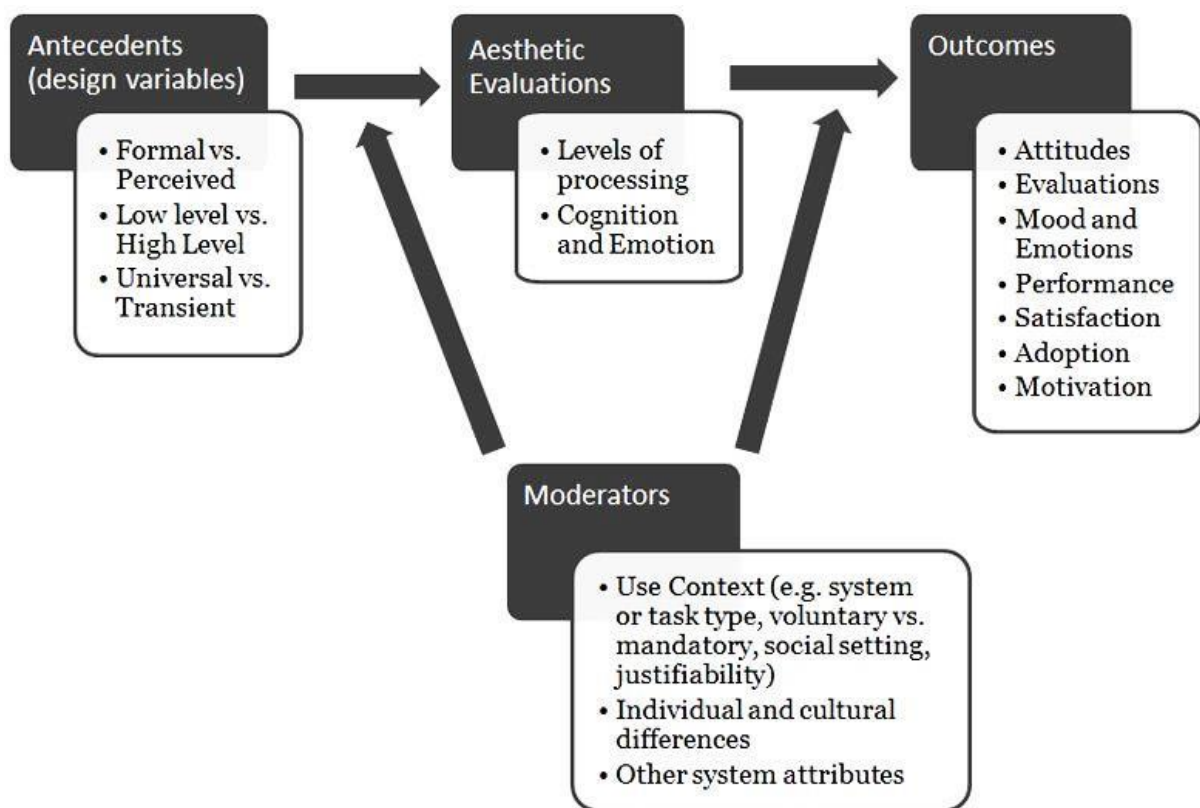


Figure 12: General framework for the study of visual aesthetics in HCI (Source: Tractinsky, 2012)

3.4.1 User-centred design

Usability tests and user-centred design techniques are now recognised as essential milestones in the development of interactive systems, including Graphical User Interface (GUI) oriented applications, e-commerce websites, mobile services and, eventually, wearable technology (Lazar, 2007; Preece et al. 2011; Porat and Tractinsky, 2012). As a result, some answers have been brought forth by IS researchers to some key questions; the questions are, among others, regarding (1) When and how to involve users and user interface design specialists in the design and development process; and (2) How to address accessibility difficulties for a product to be universal (universal usability). Many IS researchers have shared practical experiences on using usability engineering techniques and artefacts in the analysis, design and evaluation processes of interactive systems (Carroll, 2013; Shneiderman and Plaisant, 2009). Nevertheless, there are still problems being faced when using systems, which suggests that this recognition and the suggested step-by-step guidelines of incorporating the HCI processes and methodologies has yet to be reflected into business benefits (Boehm, 1991; Tractinsky, 2012).

Several researchers (Norman, 1988; Nielsen and Molich, 1990; Shneiderman and Plaisant, 2005; Dix et al., 2004; Sharp et al., 2007, 2011) have also suggested principles and guidelines for the design of interactive systems. The principles are generally provided in an abstract, high-level form that can be widely applied to a variety of situations. While the guidelines are less abstract, they can also be widely applied. Design principles and guidelines, for example, the principles of visibility and feedback, can be used to derive criteria for evaluating the usability of service systems. Applying a user-centric approach to the design of any product or service can improve the performance of service projects and the business as a whole (Mele and Polese, 2011; Sun and Zhang, 2006).

3.4.2 Supporting business and user values

Taylor and Swan (2004) stated that designers had often forced system users into acting in a certain way while at the same time lacked the understanding of human differences in terms of culture, politics, morals and social aspects. This suggested that much emphasis and expectations had been placed on system designers in order

to understand the HCI processes and methodologies. Service systems may be faced with similar emphasis (Donoghue, 2002; Porat and Tractinsky, 2012).

However, in recent years, there has been an increase in demand for usability (user experience) experts to help evaluate the usability of computer-based systems that are in the development process (Cyr, 2008; Lee and Koubek, 2010; Lindgaard et al., 2011). The demand for usability experts could be associated with business' effort or emphasis to maximise ROI by releasing or deploying computer-based systems that are user-friendly and that would readily win user acceptance the first time (Sun and Zhang, 2006). The recent trends not only relieves designers of the burden or help maximise ROI but they also provide an understanding by business owners and managers regarding the impact of HCI processes and methodologies on businesses since technology has had perverse effects in all dimensions (Cyr et al., 2006; van der Heijden, 2003; Sonderegger and Sauer, 2010). In business dimensions, this could imply winning a certain market share percentage since effective computer-based systems may serve as a competitive advantage (Kim, 2009; Mele and Polese, 2011).

The study by Donoghue (2002) suggested that usability experts can contribute in making the right business decisions when confronted with trade-offs concerning user experiences and business interests (e.g. the time to market versus usability). Nonetheless, for usability experts to efficiently contribute to business decision-making, they will have to embrace the business decision-making attitude through the establishment and demonstration of the link between usability flaws and shareholder ROI (Donoghue, 2002). The factors to consider include the characteristics of the job, the individual and the organisation that influence business or user performance (Lindgaard et al., 2006).

HCI processes and methodologies can, therefore, be indispensable in helping to optimise performance influencing factors (PIFs) or in shaping an understanding of service systems (Magoulas and Chen, 2006; Spohrer et al., 2008). Some studies have come up with quantifiable results supporting the importance of enhancing PIFs (Bias and Mayhew, 2005; Donoghue, 2002). The areas of concern, among others, would be branding, reducing costs of development and training, and improving productivity (Bias and Mayhew, 2005; Hassenzahl, 2003).

3.4.3 Enhancing performance influencing factors (PIFs)

HCI processes and methodologies are of significance to business, mostly for areas concerned with user performance (Bias and Mayhew, 2005; Ceaparu et al., 2004). HCI methodologies or processes can influence user performance (Quinn and Tran, 2010; Sonderegger and Sauer, 2010) when used to identify requirements; and define operational, support, and maintenance concepts. Other concerns would be to identify and control factors that limit user performance, identify user functions and tasks (Norman, 2004), identify and control excessive user workload, provide an acceptable working environment, identify and control excessive user stress, and identify and implement user population stereotypes (Ceaparu et al., 2004).

Table 3: Benefits associated with specific HCI processes and methodologies

-
- Identify user requirements
 - Define operational, support, and maintenance concepts
 - Identify and control factors that limit user performance
 - Identify user functions and tasks
 - Identify and control excessive user workload
 - Provide an acceptable working environment
 - Identify and control excessive user stress
 - Identify and implement user population stereotypes
 - Design for a full range of potential users (gender, size, strength, vision, clothing)
 - Develop for user acceptability
 - Develop for flexibility of use
 - Reduce opportunity for user error
 - Reduce the need for user manuals
 - Reduce requirements for new skills and Reduce likelihood of skill decay
 - Reduce personnel requirements
 - Develop lowest-cost training system (capital and/or operational costs)
 - Improve personnel selection system and personnel retention
 - Reduce time lost through accidents or injuries
-

Table 3 lists the benefits that can be derived as a result of using HCI interventions. The benefits include designing products for a full range of potential users (gender, size, strength, vision, and clothing) and developing products for user acceptability. The concerns discussed above constitute PIFs, which are the characteristics of the job, the individual and the organisation that influence business or user performance. Cultural background is also crucial when considering user performance.

3.4.4 Understanding culture

Culture encompasses behavioural characteristics, values, languages, art, music, shared preferences, rules, norms, attitudes, and beliefs to form 'cultural elements' (Segall et al., 1999). Cross-cultural cognitive psychology has been of utmost importance when used in understanding user cognitive processes influenced by cultural factors such as visual perception, memorisation, attention, reasoning, learning, categorisation, and problem-solving (Segall et al., 1999; Tractinsky, 2012). Some of the empirical studies in cross-cultural interface design have examined whether or not cultural diversity affects visual perceptions (Tractinsky, 2012). Consequently, it has been noted that differences in visual perception among users from different cultures exist because they perceive visual images in a way that they have experienced and learned.

The user experience and learning can be associated to different cultural dimensions (Noiwan and Norcio, 2005). In spite of that, HCI processes and methodologies can be used to emphasise those dimensions that are focussed on subjective aspects such as values, beliefs, patterns of thinking and behaviour, and where meaning becomes the central issue in culture (Bourges-Waldegg and Scrivener, 1998). This can be achieved by ensuring that the intended meanings of user interface representations (e.g. symbols, icons and language) are translated to suit the target cultures' correct understanding (Smith et al., 2004). In turn, social norms or factors (discussed in the next section) that bind cultures can be identified and enhanced as well.

3.4.5 Identifying and enhancing social factors

The recent research emphasis on social capital indicates a shift from enterprise emphasis as a whole to the individuals who manage and operate businesses (Mele and Polese, 2011). The shift in research focus is because of the appreciation of values users epitomise, which often informed user decision-making and behaviour.

Users' social relationships are a key factor to consider because business depends upon individuals and their relationships (Vicari et al., 2007) in such a way as to form a cultural identity. The cultural norms may include how businesses interpret and realise the missions, strategic actions, and management practices as well as values (Golinelli et al., 2002; Cross et al., 2001). The social relationships rooted in business, and, in particular, users who take part in the system are therefore vital and contribute to the uniqueness of the system performance characteristics (Mele and Polese, 2011). Even so, social relationships or networks are not flawless occurrences and can be intended differently. It may require managing the social relationships with intentions of forming social capital and increasing the possibility of creating value from the service systems (Batt, 2008). Creating value can be done by depicting how various factors in a social network may have an influence on tasks as performed by users, the business, and the environment within which they exist. The factors may concern concepts such as artefacts and technologies, roles, goals, domains, values, and tasks (Wild et al., 2009b) as outlined in an environment which has socio-cultural and physical dimensions (see figure 13). It may also show up within the system's effectiveness, functionality, and the quality of services provided. Of course, the activities performed have an impact on a business' domain, which may have an influence on set goals and the values held by the users.

Taking HCI as a form of conversation between two participants capable of processing information (Preece et al., 2011) may also be seen as a framework for examining users' tasks and environmental factors, which may affect the performance of tasks in a socio-technical set-up (Eason, 1991). Environmental factors could refer to social, cultural and physical factors (see figure 13). The physical environment may concern things such as physical surroundings in which computer workstations are operated or the visual display terminals (Eason, 1991). The interaction between humans and computers has had an impact on users in the form of change in the

nature of jobs, the way businesses operate, and the way users interact with one another (Landauer, 1996; Preece et al., 2011). Additionally, the impact could be in the form of values, benefits, goals, desired quality service, or physical form (Bias and Mayhew, 2005; Lund, 1997).

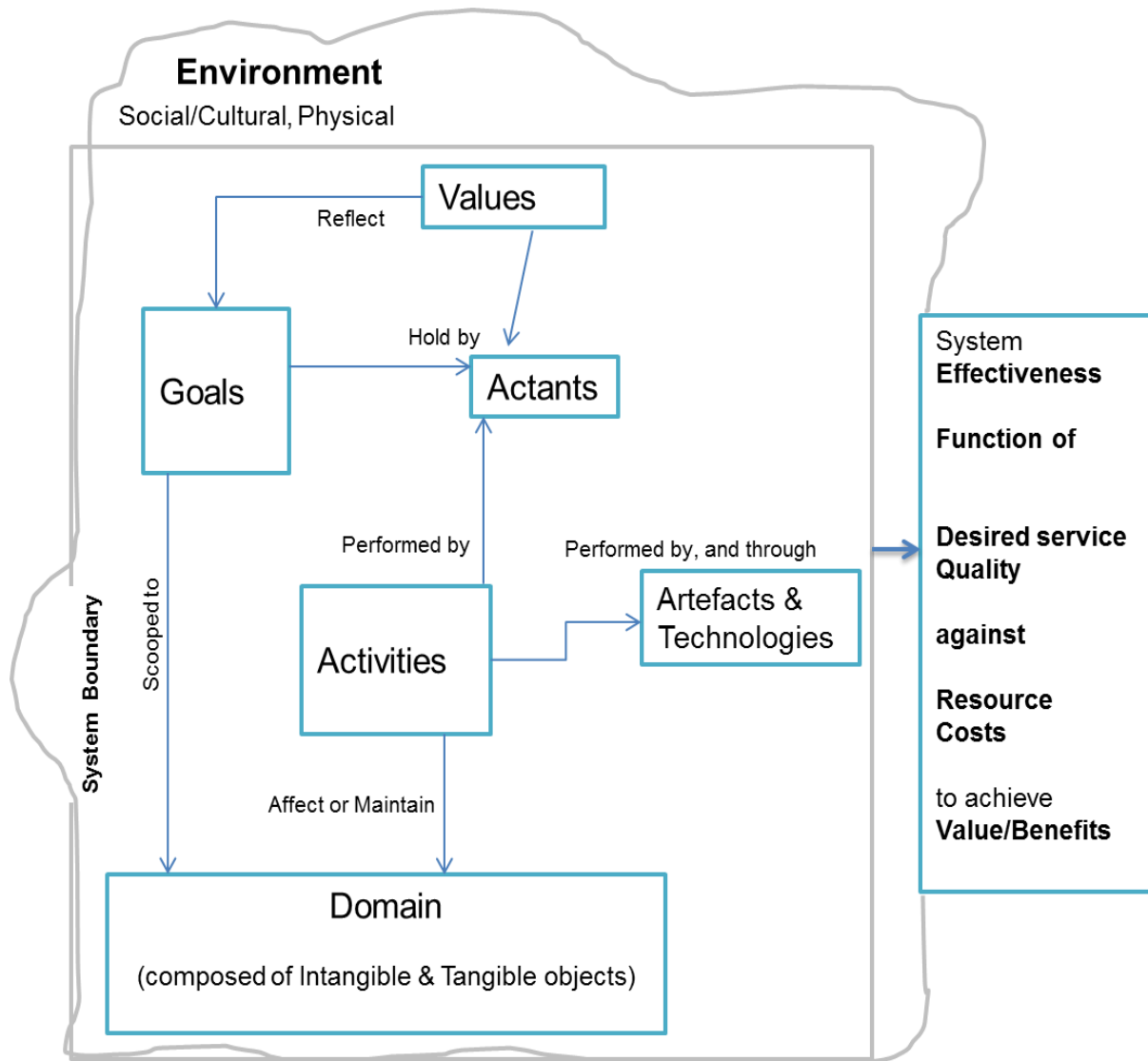


Figure 13: Schematic of the activity-based framework for services (**Source:** Wild et al., 2009a)

Table 4 outlines components of HCI, indicating concerns that range from productivity factors, system functionalities and constraints, tasks, user interface, comfort, health and safety, the users, and the organisational and environmental factors (Preece et al., 1994). The aforementioned concerns relate to the concepts illustrated in figure 13 (the schematic of the activity-based framework for services – ABFS). The ABFS

provides a model which is comprehensive in identifying all factors that contribute to HCI design (Wild et al., 2009a).

Table 4: Components of HCI (**Adapted from:** Preece et al., 1994)

ORGANISATIONAL FACTORS Training, job design, politics, roles, work organisation		ENVIRONMENT FACTORS Noise, heating, lighting, ventilation	
HEALTH AND SAFETY FACTORS Stress, headaches, musculo-skeletal disorders	cognitive process and capabilities THE USER motivation, enjoyment, satisfaction, personality, experience level		COMFORT FACTORS Seating, equipment layout
USER INTERFACE Input devices, output displays, dialogue structures, use of colour, icons, commands, graphics, natural language, 3-D, user support materials, multimedia			
TASK FACTORS Easy, complex, novel, task allocation, repetitive, monitoring, skills, components			
CONSTRAINTS Cost, timescales, budgets, staff, equipment, building structure			
SYSTEM FUNCTIONALITY Hardware, software, application			
PRODUCTIVITY FACTORS Increase output, increase quality, decrease costs, decrease errors, decrease labour requirements, decrease production time, increase creative and innovative ideas leading to new products			

The ABFS recognises a user as a complex being with cognitive processes and capabilities but also with enjoyment, motivation, personality, satisfaction, and experience. Also mentioned in the ABFS are the task-related factors (easy, complex, novel, task allocation, repetitive, monitoring, skills, and components) and constraints such as costs, timescales, budgets, staff, equipment, and building structures. The next discussion will consider some of the factors related to frustrating user experiences when using computer-based systems.

3.4.6 Identifying frustrating user experiences

Frustration may be described in relation to when the computer-based system acts in an unexpected way that aggravates users and keeps them from reaching task goals (Ceaparu et al., 2004; Lazar et al., 2005). Businesses are aware of the frustrating computer experiences that users often encounter. For example, the computer-based system crashes with no warning, taking perhaps five or more minutes of work with it (Lazar et al., 2005).

Another common occurrence is the slow response to operations (Cyr, 2008; Sonderegger and Sauer, 2010; Quinn and Tran, 2010). Frustration is a common occurrence among system users since systems do not cater for all user preferences (Lee and Koubek, 2010). Users often deal with many annoying interruptions, mismatched files, and inconceivable error messages or sometimes experience no feedback from the system about the transaction's sudden termination (Lindgaard et al. 2011; Tractinsky et al., 2006). Such system behaviour affects user trust (Bargas-Avila and Hornbaek, 2011; Cyr et al., 2010). Lazar et al. (2005) further stated that dialogue message boxes that are not clearly designed in style tend to provide users with conflicting or confusing messages, which may also contribute to lost work. Error messages that can hardly give a lead to a root cause of a problem can also waste users' productive time.

However, some frustrating experiences may result from the poor structuring of business task flows or processes (Moshagen et al., 2009; van Schaik and Ling, 2009). Frustration happens when users cannot achieve their intended task goals, and maybe as a result of a poorly designed system user interface, the failure of the hardware or software, or users having insufficient knowledge of operating the system

(Lazar et al., 2005; van Schaik and Ling, 2009). The end result is that users will not be in a position to complete their tasks as intended. Users will then have an emotional response (Thüring and Mahlke, 2007) because of the failure to achieve their goals, causing them stress, headaches, and similar inconveniences (Lazar et al., 2005). With that said, there is yet more to be known about the causes and effects of user frustrations when considered in terms of the time lost daily during the struggle with systems and the associated effect on business. It is definite that frustrating experiences do affect the users' moods, their days, and their well-being (Porat and Tractinsky, 2012; Sun and Zhang, 2006; Thüring and Mahlke, 2007). How much of this has an effect on users is yet to be quantified or measured. In addition, how this frustrating experience has an effect on workplace, family, or community is yet to be investigated with measurable results (Lazar et al., 2005).

3.5 Conclusion

HCI interventions put an emphasis on user behaviours, the characteristics of the designed system, and other attributes of the system or behavioural consequences of aesthetic evaluations. Contextual issues, such as the type of tasks are significant when considering user experiences, overall satisfaction, and performance in Service Systems. HCI interventions can help streamline services in business areas such as (1) identifying and determining how to make use of resources most efficiently and effectively, (2) monitoring and measuring the quality of services, and (3) calculating and forecasting future conditions, events, and user/customer responses.

Service Systems can benefit from HCI interventions when used to measure user productivity, reduce training costs, enhance the skill of the system user, and redefining processes or workflows to generate a competitive advantage hence quality service provision.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

The discussion in this chapter addresses the research design and methodology that was adopted and used in this study. The research design was a case study approach. A research design is a strategic framework that guides research activities. A research design has four components: (1) the purpose of the research, (2) the research paradigm, (3) the context, and (4) the research techniques or methods used (Blanche et al., 2006).

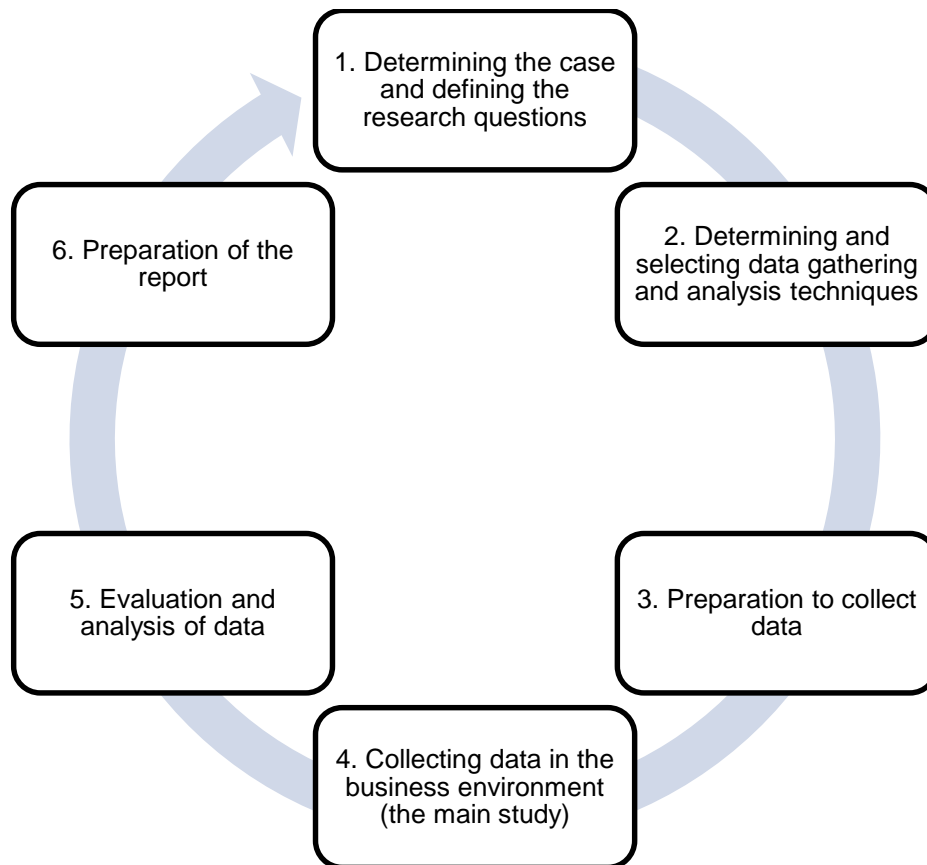


Figure 14: The six-step approach adopted when conducting the study

As stated in section 1.7 of chapter One, the purpose of this study was about finding the impact of HCI interventions may have on user productivity, training costs and skills enhancement, as well as the redefinition of business processes or workflows that can help generate a competitive advantage, and improved business operations.

The chapter was organised starting with the purpose in section 4.2, followed by the research paradigm in section 4.3, the context of study in section 4.4, and the strategy used in section 4.5. Section 4.6 discusses the six-step approach adopted, including data collection methods as shown in figure 14. Section 4.7 discusses the ethical factors that were considered when conducting the study. Section 4.8 summarises discussions of the chapter.

4.2 The research paradigm

A research paradigm provides a conceptual framework for the justification of the choice of research methodology. The interpretivist research paradigm was used when collecting, analysing and interpreting data. The conclusions arrived at, therefore, were based on reality implemented by an associated methodological approach and strategy (De Villiers, 2005). The interpretivist paradigm was used in this study because it is characterised by a belief in a socially constructed, subjectively-based reality, one that is prone to the influences of the environment; unlike the positivist paradigm that views scientific knowledge in its purest form based on observation free of environmental influences (Howe, 1988).

The underlying assumption of the interpretivist paradigm is that the ‘whole’ needs to be examined in order to understand a phenomenon. As a consequence, qualitative methods of analysis are well suited to interpretivist investigations. Qualitative methods were used in the collection, analysis and interpretation of data. However, to a lesser extent, quantitative methods were used to analyse some of the data.

4.3 The context of the study

The research was conducted in the general context of the HCI discipline with a specific focus on Service Science (service systems). In particular, the study was conducted in the travel services context whereby the computer-based system formed the object of inquiry in the aspects of HCI and service systems. In this context, the researcher wanted to look at how computer-based systems can be used to help mitigate travel risks such as staff productivity, health, safety and security; company’s reputation; and data security.

4.4 Case study strategy

A case study strategy is defined as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used” (Yin, 1984, p.23). Similarly, Noor (2008, p.1602) defined a case study as “an empirical inquiry that investigates a contemporary phenomenon within its real life context using multiple sources of evidence.”

4.4.1 Background

Case study research design has evolved as a valuable tool for studying developments and specific circumstances in many scientific disciplines. The substantiation used in a case study is characteristically qualitative in nature and emphasises developing an in-depth rather than wide-ranging, generalizable understanding. Yin (1994) presented at least four applications for a case study model: (a) to explain multifaceted fundamental links in real-life interventions; (b) to describe the real-life context in which the intervention has occurred; (c) to describe the intervention itself; and (d) to explore those situations in which the intervention being evaluated has had no clear set of outcomes. Single cases may be used to confirm or challenge a theory or to represent a unique or extreme case (Yin, 1994).

4.4.2 Application

As described above, Yin (1993) identified specific types of case studies as: Exploratory, Explanatory, and Descriptive. Stake (1995) included three others: Intrinsic – when the researcher has an interest in the case; Instrumental – when the case is used to understand more than what is obvious to the observer; and Collective – when a group of cases is studied. Exploratory case studies have been considered a prelude to social research when it comes to doing causal investigations (Simons, 1980; Yin, 1993).

Stake (1995) argued for another approach centred on a more intuitive, empirically-grounded generalisation and termed it “naturalistic” generalisation. Stake’s (1995) argument was based on the harmonious relationship between the readers’

experiences and the case study itself. Stake estimated that the data generated from case studies would experientially resonate with a broad cross-section of readers, thereby facilitating a greater understanding of the phenomenon.

In this study a descriptive type of case study approach was followed – as a single case. A descriptive type of case study focuses and details the way suggestions and questions about a phenomenon are examined and expressed before starting the project. This articulation of what is already known about the phenomenon is referred to as a descriptive theory. A descriptive theory helps in identifying the limitations and boundaries of the case, and it can contribute to the consistency of the completed case study (Simons, 1980; Stake, 1995; Yin, 1994).

This study focussed on understanding the benefits that a business may derive from implementing HCI processes and methodologies. The ACCtrav system served as a case of inquiry in the theoretical perspective of service systems, studied in its real-life context – work context.

4.4.3 Justification for a case study

Case studies are ideal when there is a need to do a holistic and in-depth investigation of relationships that exist in nature, with the aim of deducing important meanings (Noor, 2008; Yin, 1994). Rubin and Babbie (2013) added that the advantage of a case study is that it provides a richer and deeper understanding of a problem or question being investigated (cf. Yin, 1993). This often leads to a better understanding of the user experience.

Case studies emphasise detailed contextual analysis of a limited number of events or conditions and their relationships. Case studies tend to be selective, focusing on one or two issues that are fundamental to understanding the system being examined. Moreover, case studies are also known for a triangulated approach as a research strategy (Yin, 1994). Triangulation can occur with data, investigators, theories, and even methodologies. On that account, case studies have been considered excellent at revealing an understanding of complex issues or objects.

The need to conduct a holistic and in-depth investigation, emphasise a detailed contextual analysis, to select and focus on one or two issues, and to apply a triangulated approach made the choice for a case study a suitable strategy for this study.

4.5 Six-step approach adopted

This case study drew on the work of Stake (1995) and Yin (1993) following a six-step process. Consideration was given to construct validity, internal and external validity, and reliability (Yin, 1989). Levy (1988) established construct validity using the single-case exploratory design, and internal validity using the single-case explanatory design. However, external validity was more difficult to attain in a single-case study. Yin (1994) suggested using multiple sources of evidence (triangulation) as a way of ensuring construct validity. Yin (1994) listed six sources of evidence for data collection in the case study protocol. These sources are interviews, direct observation, participant observation, documentation, archival records, and physical artefacts. This study used a usability questionnaire, interviews, and observation as sources of data collection. Next is the description of the six-step process.

4.5.1 Determining the case and defining the research questions

The first step was to establish a firm research focus which would be referred to over the course of study. The focus was on ACCtrav. The ACCtrav system was selected as a single case in its real-life context of use, used by TMC and seven other organisations which formed a group of companies (subsidiary of companies) co-existing as competitors in the travel industry. The ACCtrav system was intricately connected to political, social, historical, and personal issues which provided for wide ranging possibilities of questions and added to the study's complexity.

A literature review (Chapters 2 and 3) was conducted to establish what research had already shown with regard to HCI and service delivery. This review led to refined and insightful questions about the problems and the formulation of research questions. The main research question for this study being: *What benefits can a business derive from HCI Interventions?*

4.5.2 Determining and selecting data gathering and analysis techniques

The strength of a case study method involves using multiple sources and techniques in the data gathering process (Yin, 1993). The technique of applying more than one method in a single study is referred to as triangulation. The techniques used to collect data included interviews, observation, and a questionnaire. These techniques are discussed in detail in section 4.6.4.

A triangulation approach was applied in data gathering because data gathered was largely qualitative. The ethical need to confirm the validity of the processes also called for use of triangulation. The other reason resulted from triangulation being viewed as a key methodological issue in the naturalistic and qualitative approach to evaluation (Yin, 1994). This helped control prejudice in data in order to establish valid propositions.

4.5.3 Preparation to collect data

Permission to conduct the research was sought from TMC managing director (see Appendix B: part I – Permission letter). The intent of the study and the scope were clearly stated in the permission letter of request. This included the intention of conducting interviews and questionnaires when gathering data. Also requested in the permission letter was access to copies of some of the organisation and system documents.

The divisions affected by the study were informed by the managing director's office, and the employees were asked to grant me access to and share the required information as well as cooperate during the course of the study.

The study protocols and procedures needed to identify and contact potential participants were established in advance. This was done by preparing, in advance, letters of introduction and establishing rules for confidentiality when engaged with participants (see Appendix B: part II – Confidentiality agreement).

4.5.3.1 Training

Prior to collecting data training was undertaken in a number of programmes deemed pertinent both in concept and analysis and presentation. These training programmes included business analysis, business intelligence and analytics, process analysis, emotional intelligence, basic statistics, and MS office (MS Excel, MS Word, and MS PowerPoint).

The above-mentioned courses covered various basic concepts in terminology, processes and analysis. The business analysis and business intelligence courses helped in taking and understanding information collected from various sources; such as that used in forecasting trends, creating improvements in strategies and operations, and making smart business decisions with the intention of generating business revenue and reducing costs. The course in statistics and spreadsheets helped improve on data analysis abilities.

4.5.3.2 Sample design, sampling methods and criteria used in choosing the sample size

The type of sampling used in this study was convenience sampling. Convenience sampling (sometimes known as grab or opportunity sampling) was described by Leedy and Ormrod (2010) as a type of non-probability sampling (subjects chosen in a non-random manner) and involved the sample being drawn from that part of the population which is close to hand. The sample size in this study depended on the proximity, ease of access, and convenience in order to allow for a specified inclusion criteria and homogeneity of participants (Blanche et al., 2006; Golafshani, 2003).

Participants were selected based on the assumption that they would be in a position to provide the kind of information relevant for the study. Greig and Taylor (1999) highlight that many forms of doing research require the participant's mastery of a number of basic cognitive skills such as understanding of verbal material, certain attention span, memory capacity, understanding of certain symbols, and understanding of conversation rules. Dumas (2003) came up with steps to use when selecting participants for research: (1) developing user profiles, (2) selecting

subgroups for a test, (3) defining and quantifying characteristics for each subgroup, and (4) deciding how many participants to include in a test.

Table 5 shows that a sample size of twenty-seven (27) participants was selected based on the user profile of participants, which ranged from novice to expert users; varying roles – data capturers, travel consulting experts, technical support staff, and sales/marketing; finance and accounting; and management. Five (5) participants were novice users with less than six months of working experience; five (5) were intermediate with between one and two years of working experience; and the remaining seventeen (17) had more than three years of working experience. Eight (8) of the participants were front-end consultants; nine (9) were back-end consultants; three (3) were from sales; another three (3) were from finance and accounting; and four (4) were from system support.

Three (3) participants had some degree of disability. Of those with some degree of disability, two had some degree of visual impairment – they could only see resized (enlarged) desktop icons and fonts. The other one had a physical impairment; using crutches to move (walk) around. Other factors considered included diverse experience with the ACCtrav system, different educational and cultural backgrounds, and exhibiting a higher attention span. The participants’ age ranged from 17 to 65 years but was not a key factor in the selection criteria, neither was their gender.

Table 5: Summary of participants’ profile

Experience using the system	Role or function	Disability Status
Novice with less than one year of working experience 5	Consultants – front-end 8	No disability 24
Between one and two years of working experience 5	Consultants – back-end 9	With some form of disability 3
Experts with more than three years of working experience 17	Sales and marketing 3	
	Finance and accounting 3	
	Support – Help desk 4	

Overall total number of participants: 27

All participants were professionals who voluntarily participated in the study at their own workplace setting. The participants were a convenience sample, and therefore, the researcher makes no claims for generality. Future work might focus on, among others, specific population segments, age groups, professions, educational or cultural backgrounds, and gender.

4.5.3.3 The pilot study

A pilot study was conducted using five participants considered experts within the TMC. These users were regarded as super users on the ACCtrav system and also responsible for training other users on ACCtrav. One participant was from management and the others from the back office. The methods of collecting data were tested to make sure all likely problematic areas were identified and corrected. It also helped determine whether the planned timeline was feasible and whether or not the interview and questionnaire were appropriate and effective.

The purpose of the pilot study was to help identify any risk and uncertainty about the actual study and to eliminate annoying problems that would have been encountered when conducting the main study (Billé, 2010). The pilot study, therefore, tested the feasibility of the methods so that any changes could be made in the main study if necessary.

4.5.4 Collecting data in the business environment (the main study)

The main study was conducted in three successive stages. In the first stage, participants were asked to complete a few demographic questions aimed at ascertaining and obtaining data about the general experience with computers and the computer-based system used in the study. In the second stage, activities included participants completing the QUIS questionnaire (see Appendix A) as well as an observation by the researcher while they were performing tasks on the system. In order to obtain data reflecting typical computer-based system usage, participants were asked to work on the ACCtrav system for a minimum of one hour before attempting to fill in the QUIS questionnaire.

It was necessary to conduct a careful observation of the object of the case study in order to identify any causal factors that could be associated with the observed

phenomenon. Lastly, post-test interviews were conducted immediately after each session to seek clarity on areas deemed necessary (see Appendix A). These activities are discussed next in detail.

4.5.4.1 Usability evaluation (QUIS questionnaire)

The QUIS was used to assess users' subjective satisfaction with specific aspects of the ACCtrav human-computer interface. QUIS was established by a group of multidisciplinary scholars in the Human-Computer Interaction Lab (HCIL) at the University of Maryland. The QUIS contains two parts. The first part – pre-session questionnaire – is used to assess demographic information, computer-based system experience and attitudes, and mood. The second part assesses user satisfaction from a system usability perspective.

Questions in the questionnaire were chosen after a careful review of previous research on the computer-based system aptitude scale, assessment of computer-based system attitudes, computer-based system anxiety, confidence, and computer-based system fondness (Loyd and Gressard, 1984; Nash and Moroz, 1997). Both incident-level and individual-level factors were measured in various questions. Incident-level factors were measured, such as the cause, level of frustration, and response.

The severity of disruption was measured by combining the time taken to fix the problem with the time lost due to the problem (Ceaparu et al., 2004). Computer-based system factors were separated into computer experience or self-efficacy and computer anxiety or attitudes. Computer experience was measured as years of computer use and hours spent per week on computer use, a more subjective measure of experience – also effective as a measure of computer self-efficacy. Additional measures of computer self-efficacy included confidence about their ability to correct problems, how much a participant persevered when encountering problems with the computer-based system, and how much a participant thought about unresolved computer-based system problems after being unable to correct them.

4.5.4.2 Observation

Field observation entailed witnessing participants interact with the ACCtrav system in the natural environment of use at selected TMC's offices (in Johannesburg and Pretoria). The purpose was to complement usability evaluation in identifying associated usability problems as a result of contributing factors inherent in the ACCtrav system. Novice users were given predefined tasks to complete. Providing predefined tasks enabled the researcher to focus the evaluation on specific tasks in the ACCtrav system. Expert users had complete freedom to interact with ACCtrav as they liked. This change of tactic was as a result of an insight from the researcher ascertaining that self-set goals could have been more meaningful to the QUIS than prior allocation of tasks (Locke, 1996).

All users were briefed of the intention to observe them but were not informed when they would be observed in order to get a real feel of their working day. Observation was carried out per user, selected at random. Every session lasted between 25 and 30 minutes, limited to a maximum of three (3) participants per day. There was no need for a special introduction since the researcher was already known to the participants. The researcher did not test the ability of the participants but observed any unexpected ways of use (Dix et al., 2004; Nielsen, 1993) and how participants acted and or behaved in such situations. Notes were recorded on a form for every session about events, as described next.

Observation allowed the researcher to study the interaction between participants in a variety of ways, for example, ways to check for non-verbal expression of feelings, determine who interacts with whom, grasp how participants communicated with one another, and to check how much time was spent on various activities (Schmuck, 1997). Other observed behaviours included confident readiness to experiment; readiness to listen to suggestions from peers; body language, which either conveyed enthusiasm or boredom from an activity and behavioural signs such as frowns, sighs, yawns or turning away from the computer (Bessière et al., 2005). Another objective was to observe the practicality of the system, which included the identification of tasks, ease of navigation, and use of help menus. During observation, there was no obstruction of any sort to the participants. The researcher concentrated on observing what the participants were doing and refrained from any

form of influence or interruption with prompt questions. Appendix D has details of the participants' sitting plan.

4.5.4.3 Interviews

Contextual interviews were the last activity in the interaction with participants. The interviews were conducted informally. They helped answer some questions about the social and physical environment. There was no predetermined set of questions for interviews, but they were derived from observation notes and QUIS additional notes for each participant. Interviews also served as a post-session exercise which enabled participants to give detailed responses about complex issues (Bowling, 2002) and were conducted within the participants' own environment (workstation).

All interview sessions lasted five (5) minutes or less, and no tasks or scenarios were imposed on the participants. Additional notes were taken for responses to questions asked when seeking clarification to gain a better understanding of what the participants were doing and/or thinking.

4.5.4.4 Field notes

Field notes were used to record intuitive feelings, pose questions, and document the work in progress. Furthermore, field notes were used to record testimonies (during interviews), observations, stories, and illustrations. Field notes assisted in determining whether or not the inquiry needed to be reformulated or redefined based on what was being observed. Field notes were kept separate from the primary data.

4.5.5 Evaluation and analysis of data

The data collected from the QUIS was first grouped into several profiles of interest. Profiles were produced by calculating the modes, means and standard deviations for each item in the QUIS. The means were then plotted on a graph using a scale of one (1) to nine (9). The midpoint (5) on the rating scale was used as a benchmark to show the deviations above and below the criterion. An item above five (5) was perceived to be better than an arbitrary, mediocre value. More details are given in Chapter 5.

Data from notes was analysed for pattern identification. Data from notes were treated as secondary.

4.5.6 Preparation of the report

The results are reported in a way that makes identified issues clear and understandable to the reader; this allows the reader to question and examine the study and reach an understanding independent of the researcher. The goal was to show a complex problem in a way that conveyed a facilitated experience to the reader. The researcher paid attention to demonstrating sufficient evidence to affirm that all avenues had been explored, clearly communicated the boundaries of the case, and gave special courtesy to conflicting propositions. The process involved a critical examination of the draft document for incompleteness or ambiguity. Experts, in the form of research study supervisors, were also consulted in the review process, and their comments and feedback were used to improve the validity of the report. Chapter 6 represents the report.

4.6 Ethical consideration

This study complied with the company's ethics policy. Ethical standards were adhered to in order to ensure the integrity of the researcher's conduct, intellectual honesty, accuracy, fairness, and protection of human participants involved in the process of conducting the study (Miles and Huberman, 1984).

4.6.1 Permission to conduct study

The permission to conduct the study was obtained from the relevant authorities (managing director); copied in the communication were the relevant senior management whose departments were to be affected by the study. The relevant documents are included as Appendix B.

4.6.2 Informed consent

Informed consent forms were sent to and signed by every participant prior to the data collection exercise (see Appendix B). Consent forms clearly stated to participants that they were agreeing to participate at their own freewill and by no

means were they obliged or bound to stay. The purpose of the study was also clearly communicated to every participant before they were engaged.

4.6.3 Confidentiality and anonymity

The confidentiality of the participants was paramount. Confidentiality was ensured by restricting access to data collected only to the researcher and research study supervisors. Anonymity and confidentiality of participants was guaranteed by not using or revealing their actual names in the study or in any other form.

4.6.4 Privacy

Privacy refers to the right that all information collected in the course of the study will be kept in the strictest confidence (Polit and Hungler, 1999). In this study, the participants were informed that they were free to behave in any way, share any opinion, criticism and suggestions, but that these were to be kept private, only reproduced on request of legal consideration.

4.7 Summary

The discussion in this chapter focused on the research methodology used, various techniques applied when collecting data, the sample design, and sampling techniques applied. The chapter ends with a discussion on ethical considerations, privacy, and confidentiality that were crucial to the protection of the participants and data.

CHAPTER 5: DATA ANALYSIS AND INTERPRETATION

5.1 Introduction

In this chapter, the analysis of data is discussed and the findings interpreted. Data was checked and compared to give hindsight on whether or not the challenges indeed encountered by the users of the ACCtrav system were HCI related.

Data sets were formed and the decisions whether to analyse the data as a whole or in groups were made based on the interest in the differences between the user ratings of the ACCtrav system, using a semantic differential scale of one (1) to nine (9) with two bipolar adjectives as feature descriptors; one (1) referring to the adjective with worst connotation and nine (9) being the best. Five (5) served as a midpoint of the two. When forming data sets, the researcher was interested in the statistics within each participant's data as well as suggestions from all the participants' data regarding item elements of interest in the QUIS and notes taken during the course of the field study.

The profiles were generated, and diagnostic tests were run to reveal the strengths and weaknesses of the ACCtrav system by showing the deviations of the means either above or below a criterion. The midpoint of the rating scale (5) was used as a criterion. The profiles were generated by calculating the means and standard deviations for each item in the QUIS. The means were then graphed on a scale from one (1) to nine (9). If the item mean was above five (5) (midpoint rating used as a criterion), it was perceived to be better than the arbitrary, whereas, below the criterion would be perceived as mediocre value. Confidence intervals around each mean were plotted in order to determine reliability; a 95% confidence interval that included five (5) within its boundaries was applied to indicate whether or not the mean was not significantly different from five (5) at the 0.05 level of significance; this helped to indicate whether or not the mean of an item was significantly above or below some criterion – five (5) being the criterion. Item analysis and hierarchical regression analysis were used to investigate the correlational structure of the items. These analyses were used to reveal the underlying importance or relevance of items

to the participants and overall satisfaction with specific interests in user productivity, learning and task workflows behaviour.

The chapter is arranged starting with a discussion on the participants' demographic information in section 5.2, followed by the analysis of the data and findings in section 5.3, contextual analysis and interpretation in section 5.4, and Section 5.5 covered the chapter's summary.

5.2 Demographic Information

This section discusses the demographic data of the participants. A sample size of 27 users, representing a 240-user population participated in the study and the data collection exercise (see Table 5). The sample represented almost eleven per cent (11.25%) of the total system user population. The gender composition was almost equal and consisted of 15 females and 12 males.

Five (5) of the participants were novice users with less than three months of working experience using the ACCtrav system; five (5) were intermediate users with between one and two years of working experience; and the remaining seventeen (17) had more than three years of experience. Eight (8) of the participants were front-end consultants, nine (9) were back-end consultants, three (3) were from sales and marketing, another three (3) were from finance/accounting, and four (4) were from system technical support. Three (3) participants had some degree of disability. Of those with some degree of disability, two had some degree of visual impairment – they could only see resized (enlarged) desktop icons and fonts. The other one had physical impairment; using crutches to move (walk) around. At the time of this study, the company strength was at 248 staff, comprising 67 males and the rest were females. The very nature and the aims of this study made the age factor of the participants not to be regarded as priority information, but for the sake of mention, the youngest participant was 17 and the oldest was 72.

5.3 Analysis of the data and findings

The factors discussed in this section include the general experience with computer-based systems as discussed in section 5.3.1; experience with the ACCtrav system in

section 5.3.2; overall user reactions with ACCtrav, including user satisfaction, frustration and anxiety in section 5.3.3. Frustration levels from user reactions when using the system was measured through incident factors that includes the time lost, time to fix, and the importance of the tasks. Sections 5.3.4 to 5.3.5 covers discussions on task execution, error handling, speed of transactions, and productivity within the tenets of designing screen interface elements such as layout and sequence, font size and the images used, the consistence of terminologies applied within the system, and the user's capability to learn the system.

5.3.1 Past experience working with computer-based systems

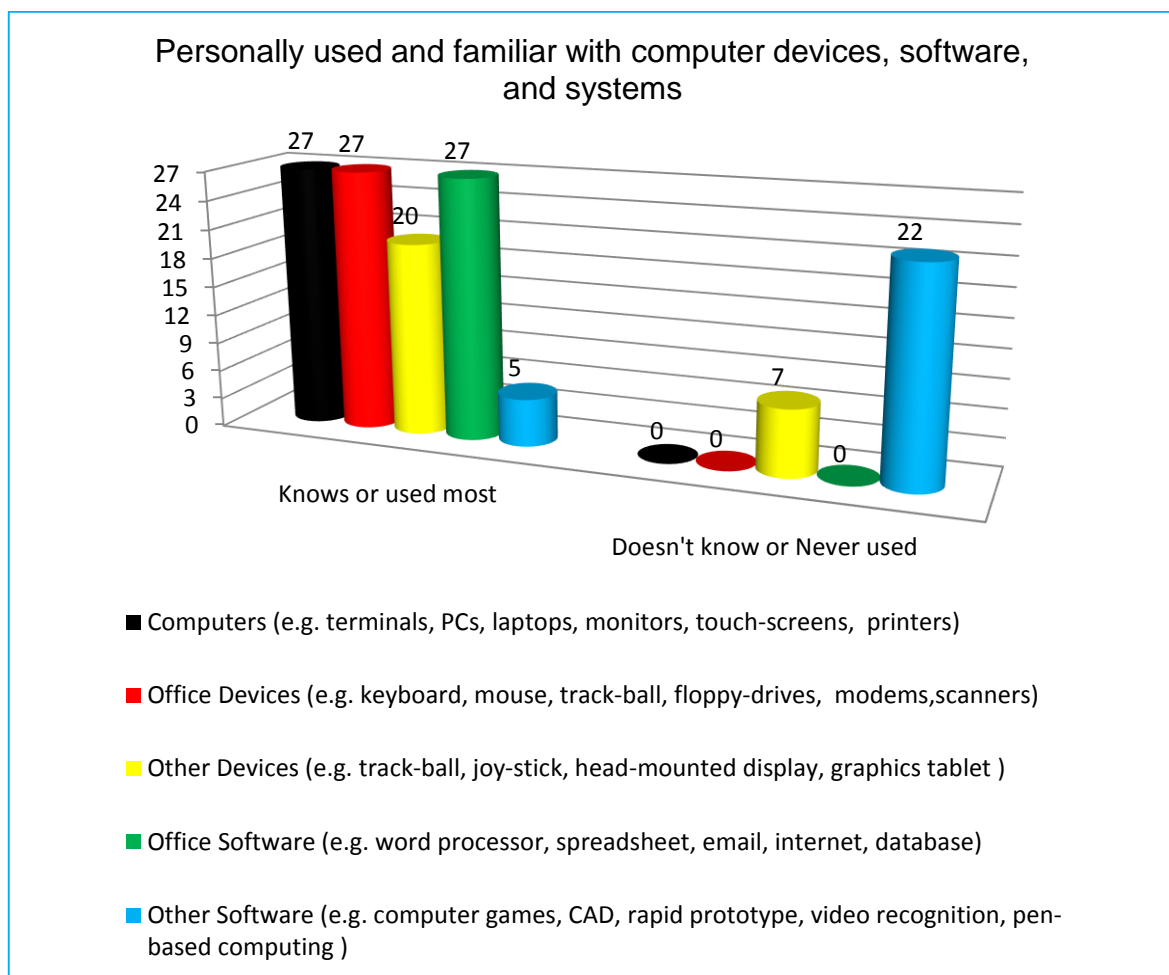


Figure 15: Knowledge on computer devices, software, and systems

The general work experience with computer systems was a crucial factor in determining the level of computer literacy among the participants. All the participants

had high levels of self-reported perceived computer awareness and experience (see figure 15).

The participants reported being knowledgeable and familiar with the use of most office computing systems, software and devices such as personal computers, laptops, modems, mouse, keyboards, word processors, spreadsheets, email, and the Internet. Twenty (20) out of the 27 participants (that is 74.1%) had used computer devices such as, track-balls, joysticks, and graphic tablets. The participants in this study were regarded to have satisfactory knowledge on computer literacy.

5.3.2 Experience working on the ACCtrav system

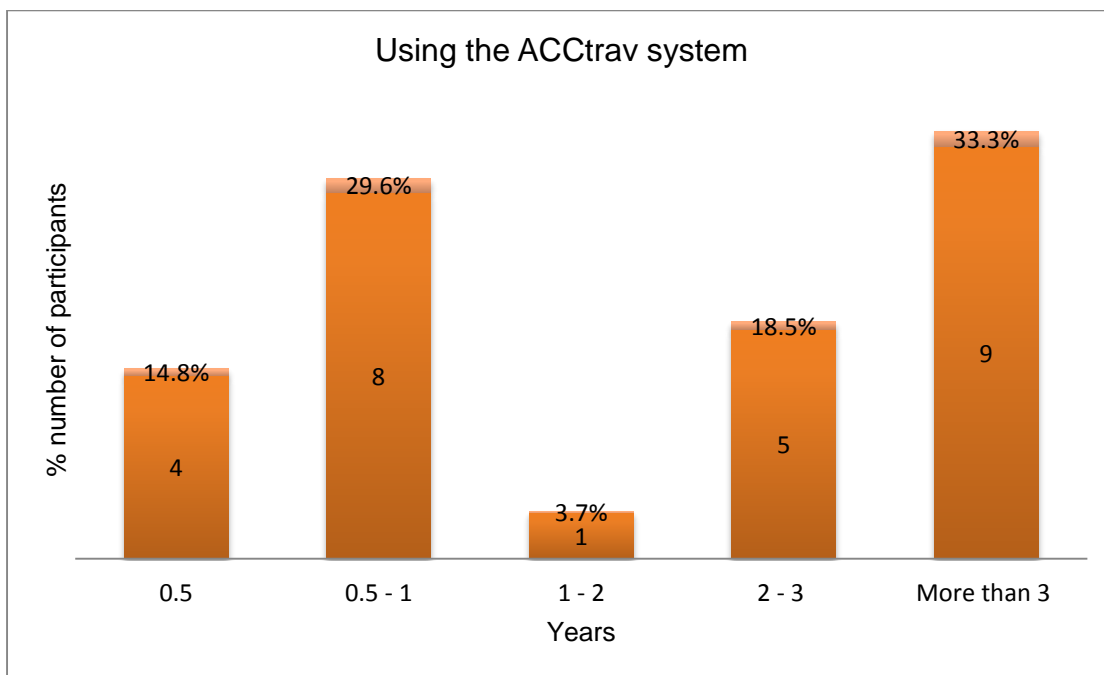


Figure 16: The amount of time spent working on the ACCtrav system

Figure 16 shows the recorded overall experience in years that the participants had using the ACCtrav system. The results show one-third (33.3%) of the participants had more than three years' experience using the ACCtrav system. Furthermore, 18.5% had more than two years but less than three years' experience, while 3.7% had one year but less than two years' experience. Almost one-third (29.6%) had less than one year experience, but with over six months' experience; on the other hand, 14.8% had less than six months' experience. The results in table 6 showed the

recorded number of hours spent per week using ACCtrav. Almost two-thirds, 63%, of the participants spent more than 10 hours a week working with or using the ACCtrav system. Figure 16 may also be suggesting the time users have been working for the company. This shows that almost one-half (48.1%) of the participants had worked in the company for less than two years, 44.4% of whom have not made it to their first anniversary.

Table 6: Time spent (hours) a week on the ACCtrav system

Hours	Number of Respondents	Percentage	cumulative percentage
< 1	1	3.7%	3.7%
1 - 4	2	7.4%	11.1%
4 - 10	7	25.9%	37.0%
More than 10	17	63.0%	100.0%
Total	27	100%	

5.3.3 The overall user reactions to the ACCtrav system

The participants were asked to rate their overall state of reactions towards the ACCtrav system using a semantic differential scale of one (1) to nine (9), with two bipolar adjectives as feature descriptors; one (1) referring to the adjective with worst connotation and nine (9) being the best. Five (5) served as a midpoint of the two. The QUIS items of interest discussed in this section included: 3.1-Terrible/Wonderful; 3.2-Frustrating/Satisfying; 3.3-Dull/Stimulating; 3.4-Difficult/Easy; 3.5-Inadequate/Adequate power; and 3.6-Rigid/Flexible (see Appendix A: Part 3). Table 7 shows the computed results for each item. For item 3.1-Terrible/Wonderful, up to 26% of the participants thought that the ACCtrav system was terrible, while 48% considered ACCtrav a wonderful system; the other 26% indicated a neutral stance. The mean score rating for this item was 5.4; the standard deviation (SD) was 2.1; and the coefficient of variation (CV) was 0.3924. The mean was slightly above the criterion. For item 3.2-Frustrating/Satisfying (see figure 17) shows the user rating levels that are significantly skewed towards the extreme ends; it was observed that 18.5% participants considered ACCtrav frustrating (rated 1 and 2) as well as satisfying (rated 8 and 9).

Table 7: Overall user reactions

Score Rating	3.1 Terrible/Wonderful			3.2 Frustrating/Satisfying			3.3 Dull/Stimulating			3.4 Difficult/Easy			3.5 Inadequate/Adequate Power			3.6 Rigid/Flexible		
	Participants	% Frequency	cumulative %	Participants	% Frequency	cumulative %	Participants	% Frequency	cumulative %	Participants	% Frequency	cumulative %	Participants	% Frequency	cumulative %	Participants	% Frequency	cumulative %
1	2	7.4%	7.4%	5	18.5%	18.5%	1	3.7%	3.7%	0	0.0%	0%	0	0%	0%	0	0%	0%
2	1	3.7%	11.1%	0	0.0%	18.5%	0	0.0%	3.7%	0	0.0%	0%	1	4%	4%	1	4%	4%
3	1	3.7%	14.8%	3	11.1%	29.6%	4	14.8%	18.5%	2	7.4%	7%	2	7%	11%	2	7%	11%
4	3	11.1%	25.9%	5	18.5%	48.1%	5	18.5%	37.0%	1	3.7%	11%	3	11%	22%	1	4%	15%
5	7	25.9%	51.9%	3	11.1%	59.3%	11	40.7%	77.8%	6	22.2%	33%	6	22%	44%	8	30%	44%
6	5	18.5%	70.4%	4	14.8%	74.1%	3	11.1%	88.9%	4	14.8%	48%	8	30%	74%	4	15%	59%
7	3	11.1%	81.5%	2	7.4%	81.5%	0	0.0%	88.9%	1	3.7%	52%	2	7%	81%	5	19%	78%
8	3	11.1%	92.6%	4	14.8%	96.3%	1	3.7%	92.6%	7	25.9%	78%	4	15%	96%	5	19%	96%
9	2	7.4%	100%	1	3.7%	100%	2	7.4%	100%	6	22.2%	100%	1	4%	100%	1	4%	100%
Total	27	100%		27	100%		27	100%		27	100%		27	100%		27	100%	
Mean	5.4			4.7			4.9			6.7			5.7			5.9		
Mode	5			4			5			8			6			5		
Median	5			5			5			7			6			6		
Standard Deviation	2.1			2.5			1.8			1.9			1.7			1.8		
Coefficient of variation	0.3924			0.5220			0.3603			0.2891			0.3017			0.2957		

Generally from the midpoint, the results showed almost an equal rating, with 40.8% participants finding the ACCtrav system satisfying compared to 48.1% who find it frustrating. However, the mean rating was slightly below the criterion at 4.7 with the SD at 2.5 and the CV at 0.5219.

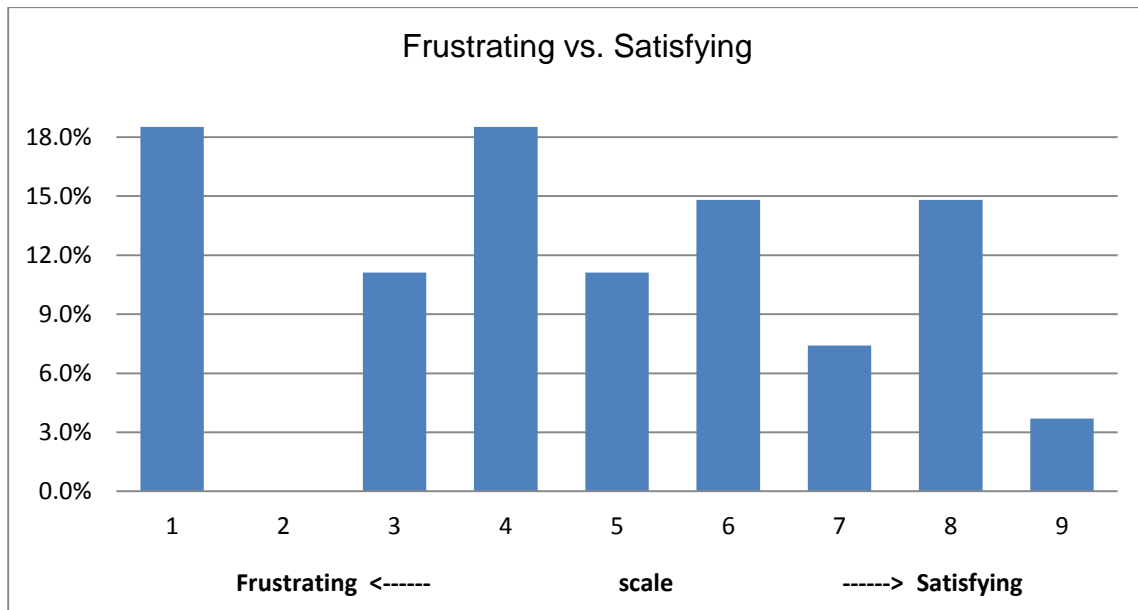


Figure 17: Frustrating vs. Satisfying histogram

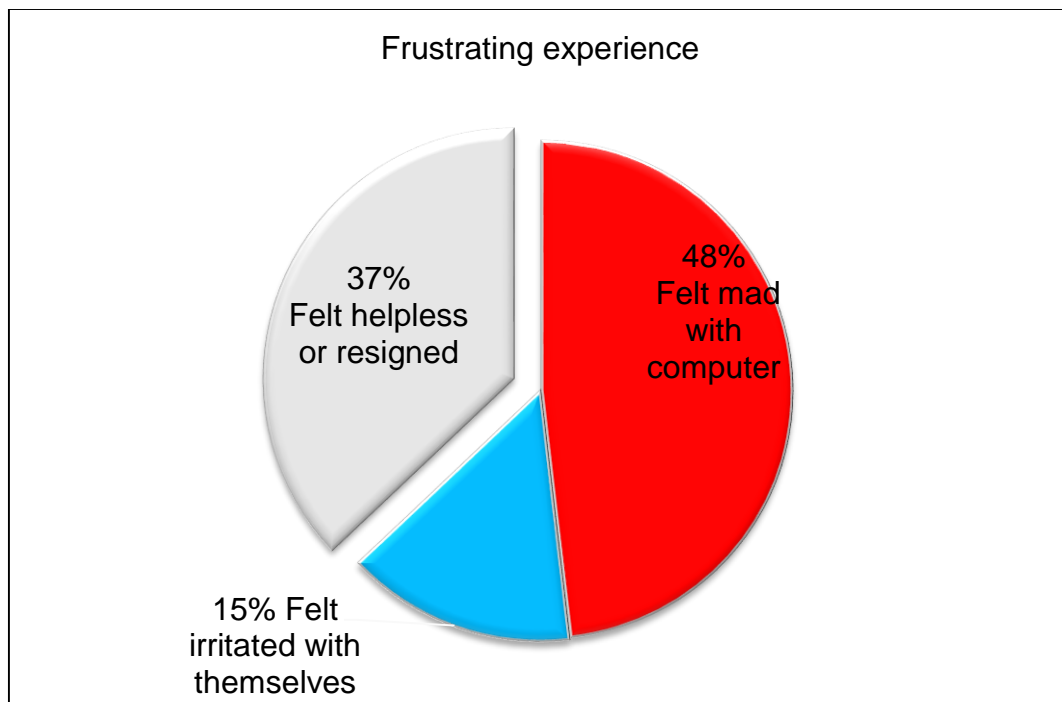


Figure 18: State of feelings after a frustrating experience

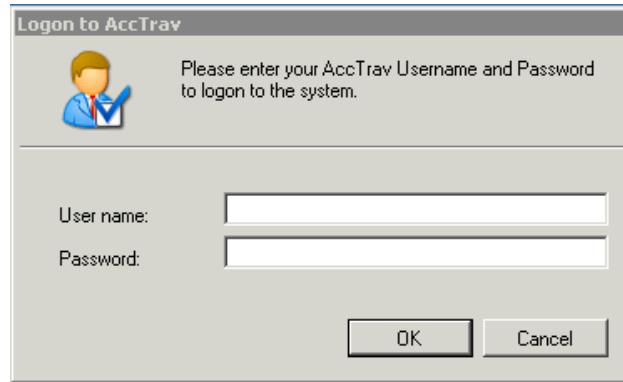
The participants were also asked to express their feelings after a frustrating incident in an effort to define the kind of response stimulated after experiencing a problem with the ACCtrav system (see figure 18). Up to 48% of the participants felt mad at the computer after encountering a frustrating experience with the ACCtrav system. 15% participants recounted themselves feeling irritated, and the 37% recounted feeling helpless and/or gave up. The results suggest users may have experienced a sense of defeat when faced with computer complications.

On the item 3.3-Dull/Stimulating, results show that up to 37% participants considered the ACCtrav system dull, while 40.7% did not know what to say of the system's aesthetics, and 22.2% thought of it as stimulating. The mean, SD and CV were 4.9, 1.8 and 0.3603 respectively. Nevertheless, up to 37% participants expressed finding the system interface dull, while 40.7% did not know what to say of the screen's aesthetics. When considered together, the participants who saw the interface as either dull or did not know what to say of it, sum up to 77.8% compared to 22.2% as stimulating.

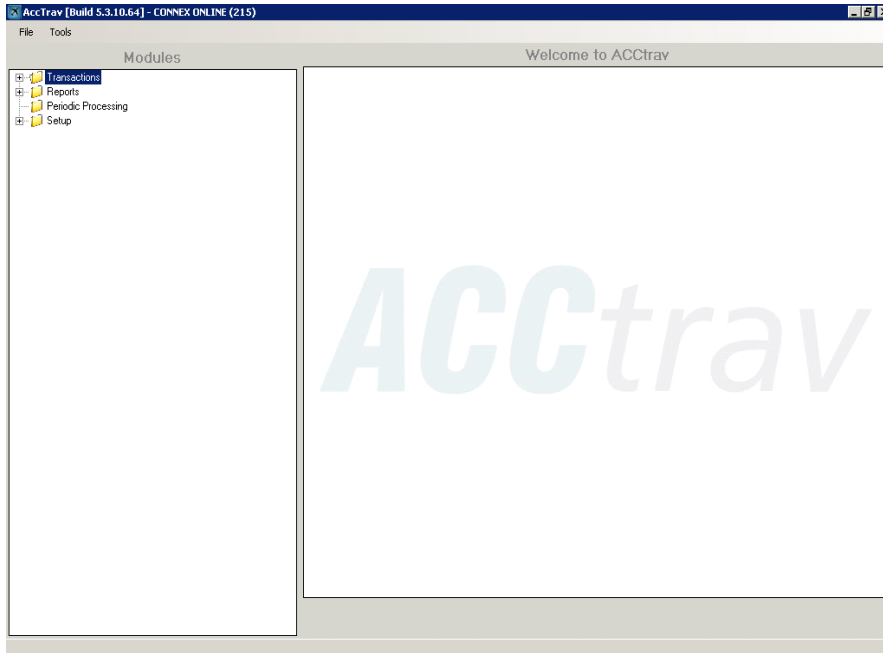
The mean for the items 3.4, 3.5 and 3.6 were above the criterion, which implied that the system was easy, flexible, and had adequate power. The majority of the participants, approximately 66.7%, found the system easy to use as compared to 11.1% who had difficulties.

5.3.4 The ACCtrav system user interface (Screen)

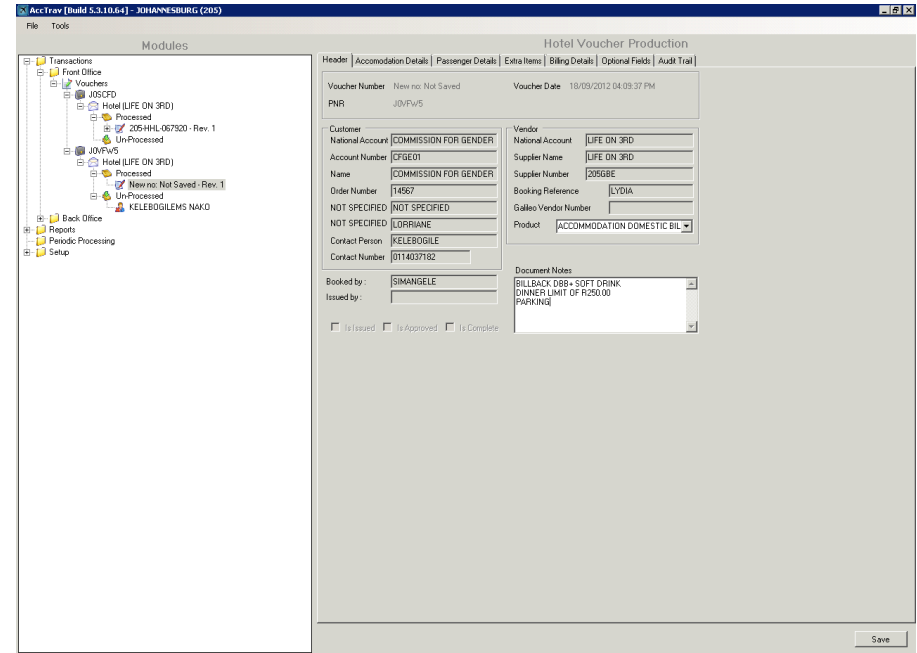
In this section, the areas of interest for discussion of the system user interface ranged from the user's ability to read characters/text on the screen; the interface layout; navigation, and the sequence of screens; the amount of information displayed on each screen; the arrangement of information on screen, to the progression of work-related tasks. Also considered in this section was the user satisfaction with the interface. Figure 19a shows the ACCtrav system logon interface that popped up after a user had clicked the icon-link on the desktop. Figure 19b shows the interface after successful login, where the activities and tasks were done. The activities/tasks displayed in Figure 19b include: transactions, creating reports, periodic processing, and set-up. The activities are displayed in the left pane of figure 19b, whereas, in the right pane are tasks (see Figure 19c).



a)



b)



c)

Figure 19: The ACCtrav system user interface (a) before login, (b) after successful Login, (c) Hotel voucher creation transaction

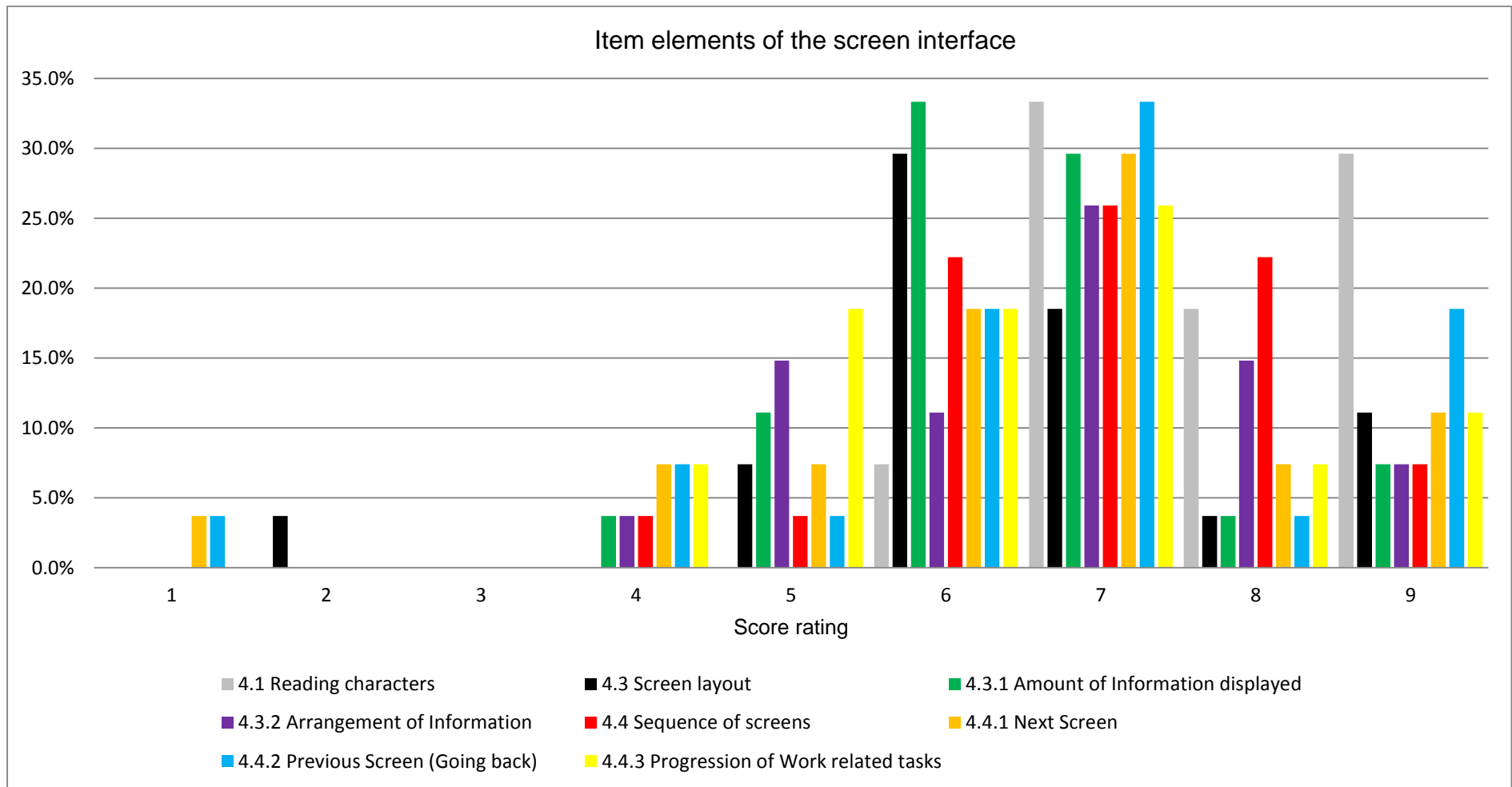


Figure 20: Item elements of the screen interface

The results show twenty-five (25) out of the 27 of the participants (that is 92.6%) could easily locate the ACCtrav system icon-link from the desktop and did not experience logon difficulties. The participants indicated a general user satisfaction with the ACCtrav system interface; up to 85.2% of the participants found the fonts on the screen very legible and easy to read, and with no fuzzy images. Locating tasks was also straightforward. When considering the sum total of the score rating between six (6) and nine (9), over 88.9% of the participants acknowledged that the screens had an adequate amount of information displayed, and 63% found the information arranged logically (See Figure 20). The participants found the screen layout not very helpful despite 74.1% of the participants finding the sequence of screens clear, and over 59.3% finding it predictable and easy to navigate the interface.

When considering the tasks, 66.7% of the participants found the progression of work-related tasks had been clearly marked on the screens. In addition, there existed some concerns expressed on tasks when participants were asked for additional comments. The remarks concerned the inability to link from the system interface to other relevant task information such as when users were inquisitive of ticket ranges. Instead, the users often browsed separately out of the system interface for such information. This could be an indication of flawed task design, which instead, would have been integrated within the ACCtrav system interface with either a search command option or browse-link to the relevant files. Further analysis of the comments on the interface reveals a suggestion of re-evaluating the interface layout in spite of the perceived ease of use. About 37% of the participants found the screen to look old-fashioned or outdated, unexciting, lacked intuitive engagement, and or was perceived inhibitive.

These observations may have had some negative impact on user productivity since enthusiasm to work on the system could have been prejudiced by the perceptions of the screen (Bessière et al., 2005; Tractinsky, 2012). One such pointer was a comment that it was frustrating after having worked on the system for some time, most especially when a user wanted to quickly get to specific tasks or information. In this regard, this comment was made: "Everything on the menus is drop-down, which means scrolling through the entire menu-list to select what you are looking for." Some offered suggestions. One such suggestion of interest was: "It should have a

function whereby you can display or call up all hotel properties in an area, say a city. That is display all hotels/guesthouses loaded under say JNB/CPT, etc.”

The comments highlighted the need to study the participants’ response in comparison of the QUIS items surveyed, especially seeking to understand the relationship between some of the items. For example, comparing item 4.3-Screen layout were helpful with item 4.4-Sequence of screens; and comparing item 4.3.2-Arrangement of information on the screen with item 4.4.3-Progression of work-related tasks. First, the researcher determined the individual items’ calculated mean, standard deviation and coefficient of variance, which were 4.8, 3.2110, and 5.1082 for item 4.3-Screen layout were helpful; item 4.4-Sequence of screens had 5.9, 2.7586 and 6.3820, whereas item 4.3.2-Arrangement of information on the screen had the mean, standard deviation and coefficient of variance as 5.2, 3.0926 and 5.6239. Item 4.4.3-Progression of work-related tasks had 5.7, 2.4898 and 6.1823 respectively. All means were above the set criterion of five (5). Figure 21 shows the relationship between items 4.3-Screen interface layout and 4.4-Sequence of screens (interface navigation).

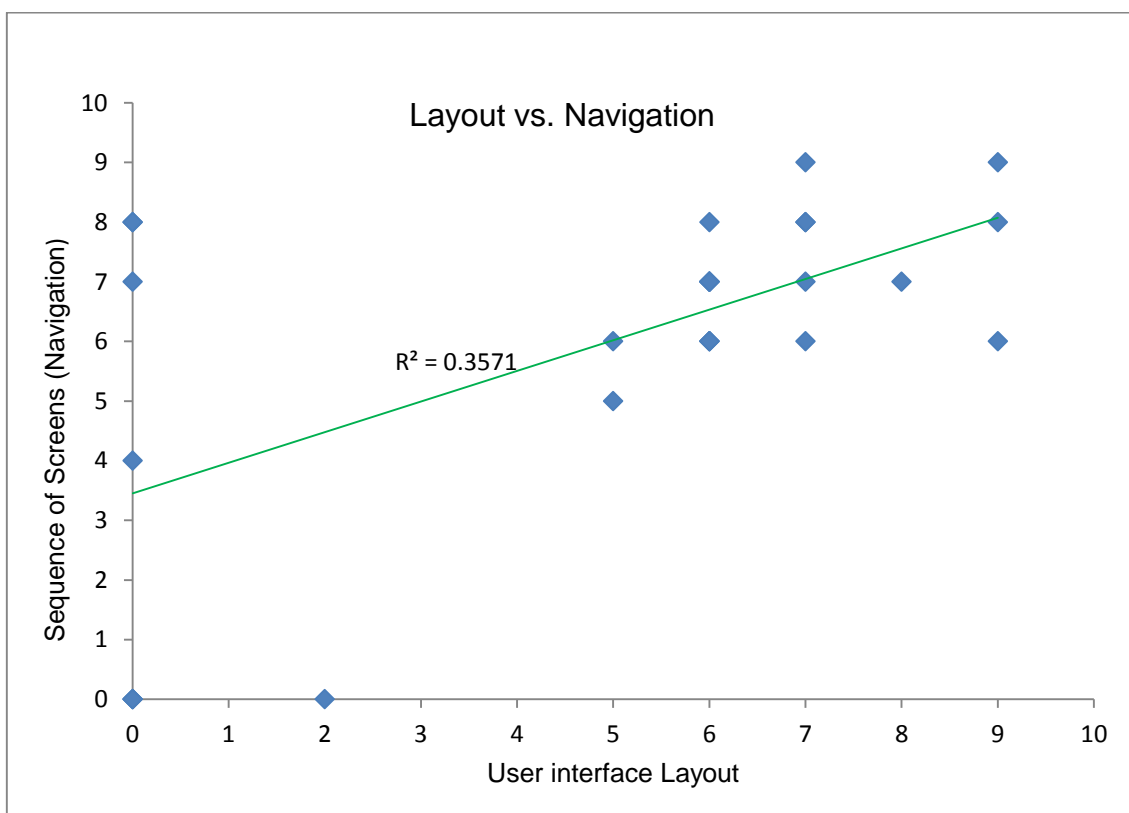


Figure 21: The relationship between interface layout and navigation

The results show the calculated covariance of 5.2934 between the data sets and the correlation coefficient 0.5976, and coefficient of determination R^2 was 0.3571. This gave a strong confirmation of the existence of a positive relationship between the layout of the interface and the ease with which to navigate that interface. The results give a direction from which designers of the ACCtrav system should build from to improve on the system effectiveness; especially encouraging users in self-learning the system (Shneiderman and Plaisant, 2009; Preece et al; 2011). The better the design of the system user interface layout, the more likely users will be able to understand and easily navigate and or learn the system. The researcher needed to look at other factors of learning, among others, user motivation and aptitude, presentation, and environment before sanctioning a user's ability to learn a system from the perspective of the interface design.

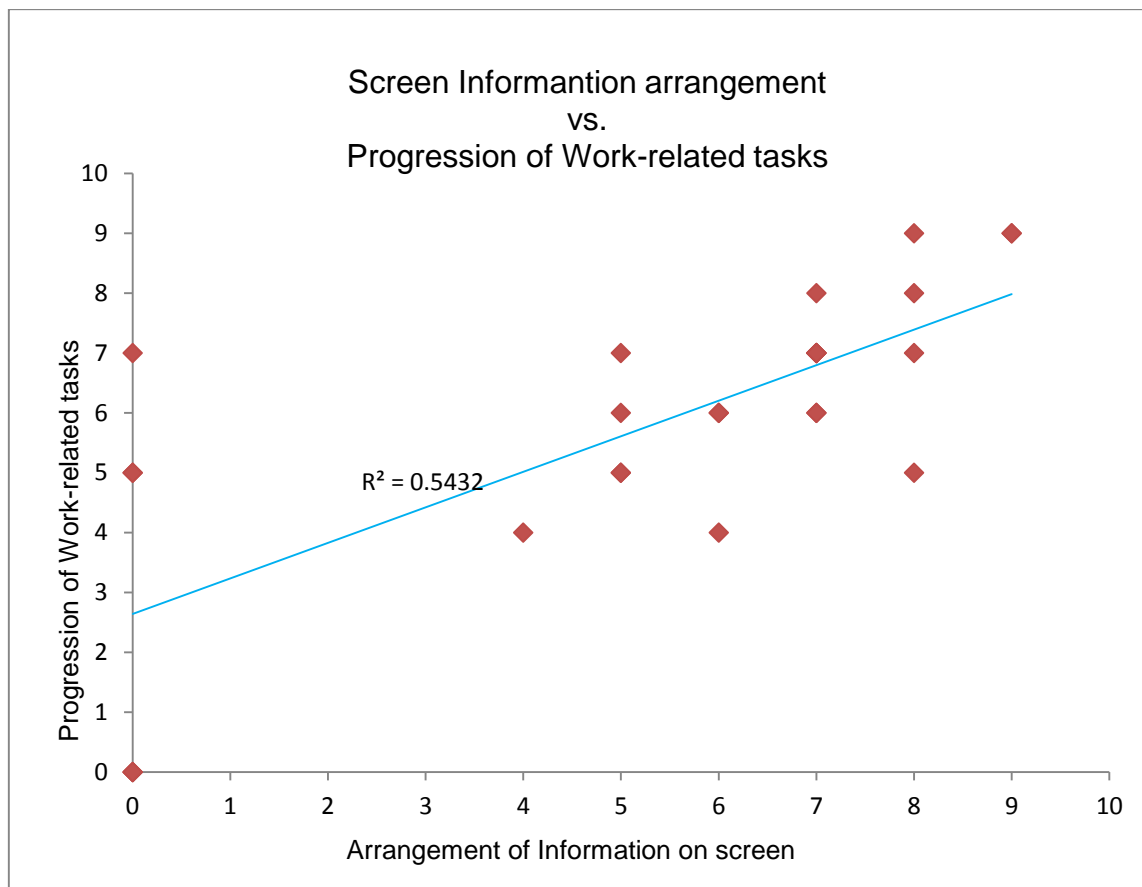


Figure 22: The relationship between the arrangement of information on the screen and the progression of work-related tasks

On the other hand, when the researcher sought to understand the outcome of the relationship between items 4.3.2-Arrangement of information on the interface and 4.4.3-Progression of work-related tasks (see figure 22), the calculated covariance

was 5.6752 and the correlation coefficient was 0.7370, and the coefficient of determination R^2 was 0.5432. The correlation coefficient indicated a stronger positive relationship between the arrangement of information on the interface and progression of work-related tasks. The clearer system instructions are displayed and well arranged on the interface, the more likely the user's ability to accomplish tasks will be facilitated by reinforcing easing memory load on the user (Carroll, 2013). However, there may be other factors that help impact overall users' enthusiasm and the ability to learn systems. The next section covers a discussion on some of the factors concerning the learning of the ACCtrav system.

5.3.5 Learning the ACCtrav system

Learning forms the prime foundation for knowledge creation, be it tacit or explicit. It is, therefore, crucial for businesses to deploy computer-based systems that encourage a self-learning culture amongst the workforce. The systems can play a pivotal role in facilitating creativity among the users, which may help the business develop the ability to leverage, venture, and or innovate with the aim of forming new value propositions.

Success factors for computer-based systems to encourage learning may include a well-designed user interface, straightforward tasks and fewer steps to take when completing tasks. They may also include providing progress information or feedback when completing tasks, easy to remember use of commands and names. Additionally, they may provide for feature exploration, a help menu and well-phrased error messages that clarify errors and/or provide clear instructions to correct the error.

In the case of the ACCtrav system, there were some interesting revelations when probing the data for the participants' learning experience. Figure 23 shows the percentage; although negligible, the participants had the view that, in learning systems, the following factors did not have an influence or were considered to be important: 3.7% on discovering new features, 7.4% when exploring advanced features, 3.7% when remembering specific rules about entering commands, 7.4% on whether or not tasks were performed in a straightforward manner, 3.7% on the number of steps and the logical sequence per task, and 3.7% on the feedback when completing tasks.

In comparison to the above results, almost two-thirds (63%) of the participants surveyed acknowledged that tasks could be performed in a straightforward manner. It was indicated that 40.7% thought the number of steps taken to complete a task in the ACCtrav system were appropriate, whereas, 22.2% thought the steps were too many, and 37% were not certain of whether or not the steps were too many. Just over one-half (51.8%) acknowledged that the steps to complete tasks always followed a logical sequence; on the other hand, 14.8% considered that there was never enough logical sequence of steps, and about one-third (33.3%) took a neutral stance.

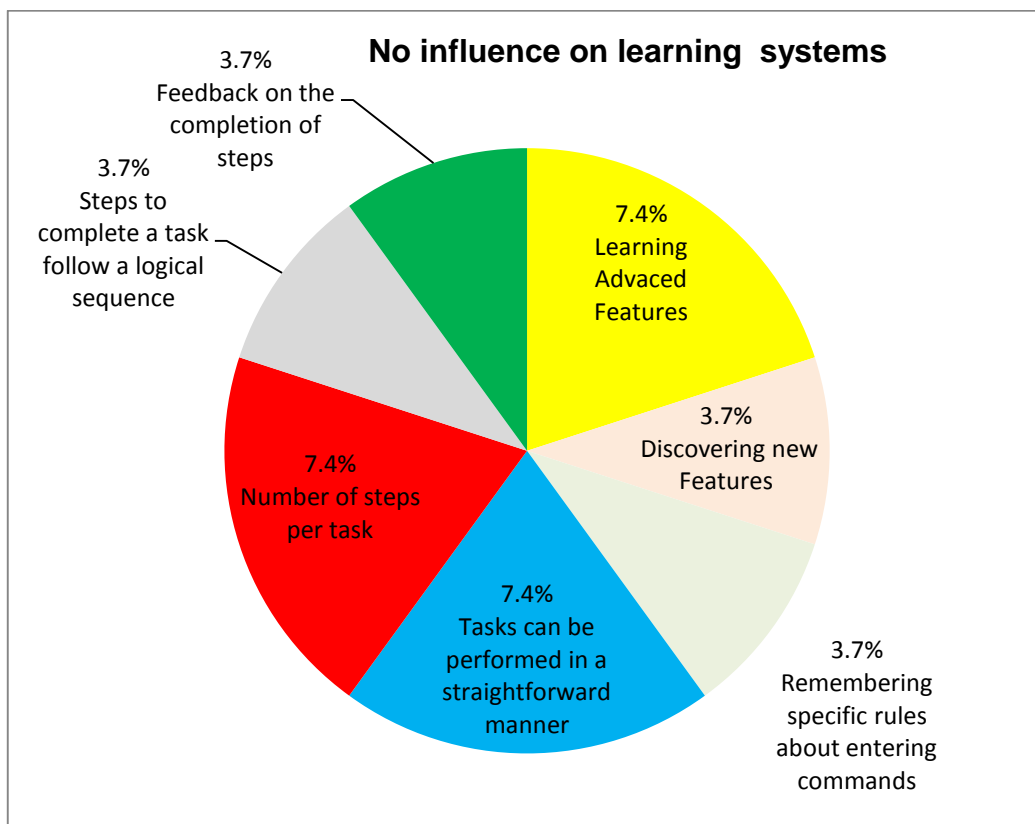


Figure 23: Items regarded not to have influence on learning

The other aspect that the researcher was interested in was the ease with which users can operate the ACCtrav system irrespective of the level of experience, and whether or not tasks could be accomplished knowing only a few commands and/or use of features or shortcuts. Almost one-half, 44.4%, of the participants acknowledged that the ease with which to operate the ACCtrav system depended upon the user's level of experience. Be that as it may, 62.9% of the participants said they easily learned to operate the ACCtrav system, 55.5% of whom took a short time

to learn to use the system. Moreover, 40.7% of the participants found it easy to learn advanced features, while 77.8% discovered new features with ease, and 70.4% felt safe when exploring features in the ACCtrav system.

To get better clarification on users learning ACCtrav, it was necessary at this point to realise that learning any system cannot be only a single, one-dimensional property of a user interface. Effective learning of systems may be linked to other factors including error frequency as well as how often users make errors while using the system, how serious the errors may be, and how users recover from these errors. Nonetheless, the ability to remember the steps of operating or entering commands into system serves as a critical aspect when learning to use a system. For instance, if a user had once used the system, how much enough could they (the user) remember next time to effectively operate the system, or does the user have to start all over again learning everything. The researcher undertook to find the correlation between items 6.3-Remembering names and use of commands and 6.1-Learning to operate the system (see figure 24). There was a positive relationship with a correlation coefficient of 0.6226 and the coefficient of determination R^2 was 0.3877. This relationship could have been stronger and better if more users felt encouraged to explore ACCtrav features by trial and error (66.7% of the participants felt discouraged).

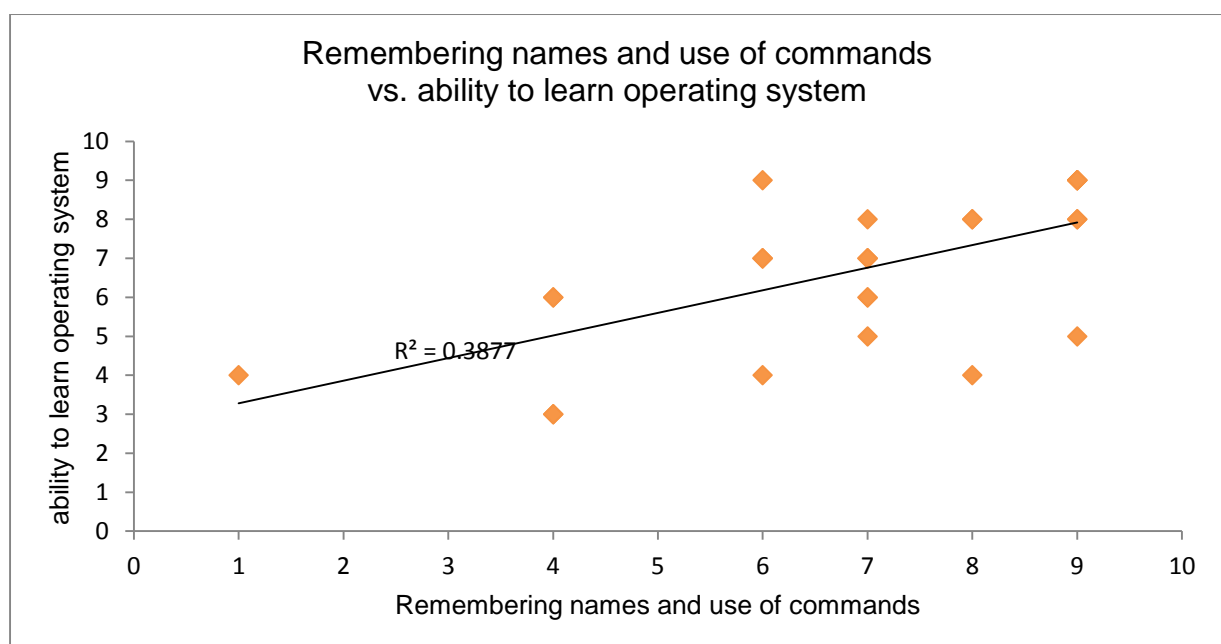


Figure 24: The relationship between remembering names and use of commands and the ability to learn operating the system

The earlier results show that users felt frustrated with the ACCtrav system. Some of the causes of frustration with ACCtrav include slow operating speed and/or freezing while in the midst of tasks. Almost one-half (48.1%) of participants thought the ACCtrav system operation speed was unacceptably slow; on the other hand, 70.3% expressed unhappiness with the slow response time to most operations. About one-half (48.1%) of the participants acknowledged that the system was unreliable. Figure 25 shows the results of quartile ranges and means in a box and whisker chart for items that the researcher considered could affect users' interest in learning the ACCtrav system. These includes items 5.1.2 Work-Related Terminology; 5.4.2 Instructions to correct errors; 5.5.2 Performing an operation leads to a predictable result; 5.5.4 Length of delay between operations; 5.6 Error Messages; 5.6.1 Error Messages clarify the problem; 7.1 System Speed; 7.1.1 Response time for most operations; 7.2 The System is Reliable; 7.2.2 System failure occur; 7.2.3 System warns you about potential Problems; 7.4 Correcting your mistakes; 7.4.2 Ability to undo operations; 7.5 Ease of operation depends on your level of experience; 7.5.1 You can accomplish tasks knowing only a few commands; and 7.5.2 You can use features or shortcuts. Most of the means for these items lay below the set criterion of five (5).

All the above had negative effects on how users embraced learning the ACCtrav system. 59.3% of the participants said system failure incidences occurred so frequently, while 37% were not content with the system's warning messages about potential problems during operations. The error messages were not correct or appropriate or never existed when and where expected. For example, from the follow-up interview notes, 88.9% of the participants pointed out that there were never any prior warning messages indicating possible out of voucher range when creating a car voucher with an exhausted voucher range. Instead, the ACCtrav system displayed an error message at the end of the task execution. These error messages did not provide sufficient details to clarify the error or what steps to take to correct the error.

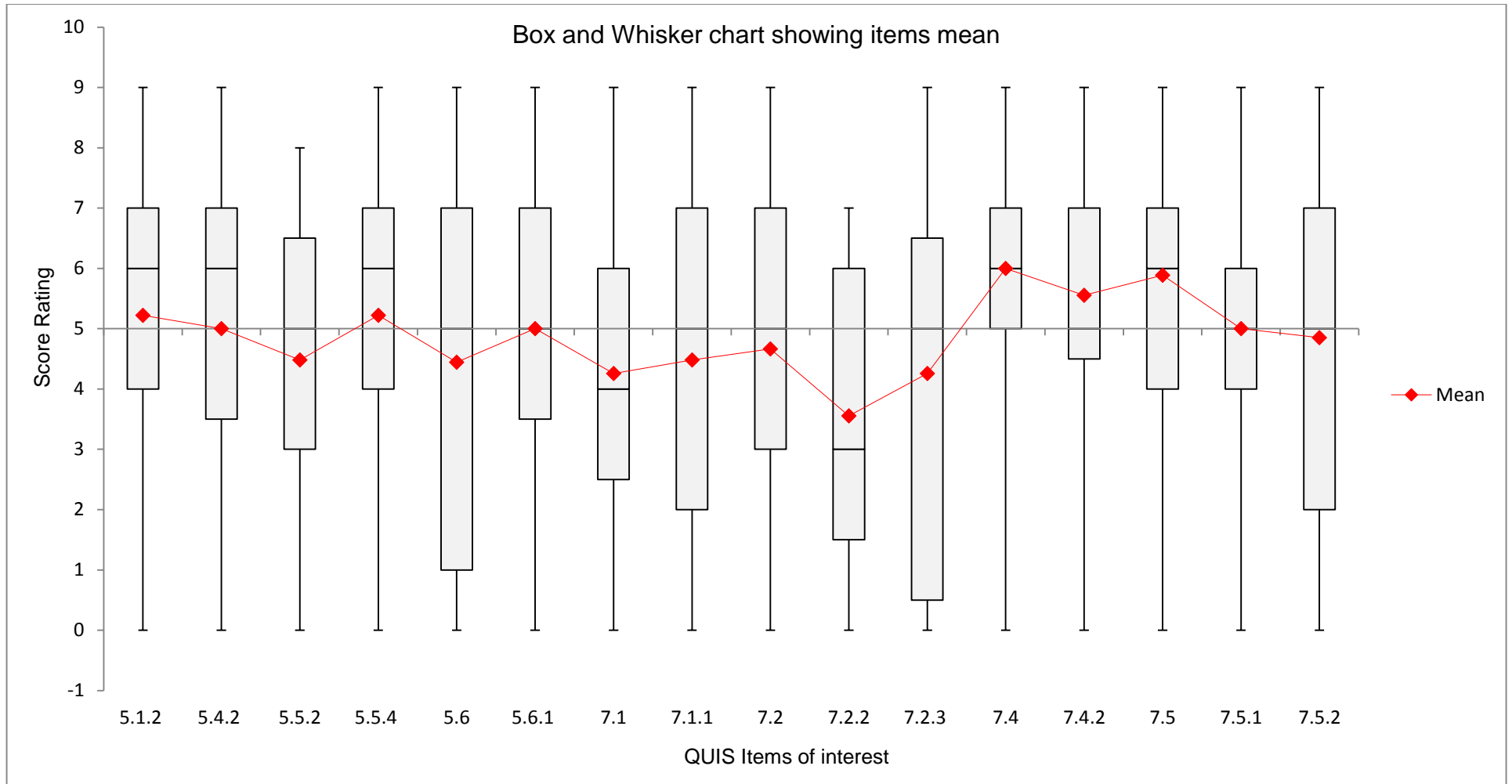


Figure 25: Mean score rating for QUIS items on learning the ACctrav system

5.4 Contextual analysis and interpretation

This section provides a discussion on how the findings of section 5.3 can be analysed and interpreted in the context of enhancing training and skills development amongst users of ACCtrav in section 5.4.1; the impact on user productivity in section 5.4.2; reflection of effective business processes in section 5.4.3; and branding, communication, value propositions and publicity in section 5.4.4.

5.4.1 Training and skills enhancement

In this section the findings of data analysis with relation to encouraging a culture of self-learning to enhance skills among users are discussed. It becomes cheaper for the business when systems are designed to promote self-learning, especially in reducing the costs of training and when implementing change of systems. The ease with which users can accomplish basic tasks the first time they encounter the system forms part of usability (learnability) (NN/g, 2013).

From the QUIS, the elements checking the learnability of ACCtrav included the attributes of self-discovery, efficiency, and satisfaction as well as error handling and messages, finding help, terminology used in the system, and the interface. The users of the ACCtrav system had mixed concerns regarding efficiency when working on the system. Efficiency of use was considered in this study as being the case when the user had once learned to use the system, how fast the user can then accomplish the tasks. Taking into consideration the number of steps taken to accomplish a task and the logical sequence of the steps could have a significant impact on learning the system. The nature of tasks at hand as well as the frequency with which the user performs those tasks can strongly influence the learning of the system.

From the results, almost two-thirds (63.0%) of the participants acknowledged that tasks could be performed in a straightforward manner. With that said, 40.7% thought the number of steps taken to complete a task in the ACCtrav system were appropriate, whereas, 51.8% acknowledged that the steps to complete tasks always followed a logical sequence. Furthermore, 62.9% of the participants said they easily learned to operate the ACCtrav system, 55.5% of whom took a short time to learn to use the system. Moreover, 40.7% of the participants found it easy to learn advanced

features, while 77.8% discovered new features with ease, and 70.4% felt safe when exploring features in the ACCtrav system.

The results suggested the ACCtrav system was developed to facilitate learning for novice users in mind. However, experienced users will normally showcase their level of know-how or skill on a system by using a product's advanced features, the understanding of what feature to use when faced with a certain need or task, and the ease with which they can locate a feature needed, which is a principle of discovery. Discovery involves looking for and finding a product's feature in response to a particular need. Learning, hereafter, would refer to the process by which the user figures out how to use a discovered feature to complete the task at hand. This kind of aptitude was not observable among the participants despite the above results showing the ease with which users learned to use ACCtrav. Often, the users had to relearn using features they had already been trained on; it was asserted by 44.4% of the participants that the ease with which to operate the ACCtrav system depended upon the user's level of experience. Seemingly, this was against the principle of ease of learning, which is expressed in how fast a user who has never seen the user interface before can learn it sufficiently well to accomplish basic tasks.

Further analysis of the results showed likely skills deficiency and/or the lack of a culture of self-learning amongst the users. Two-thirds (66.7%) of the participants felt they were never encouraged by the ACCtrav system to learn and/or explore advanced features through trial and error. The results did not give the definitive lead to what may have been factors causing this perception and behaviour on learning or improving on the skills level. Nevertheless, it was clear, though, from the results that the system user interface may have an impact on how users may acquire skills through self-learning. For example, there was a positive correlation between the system interface layout and system navigation, the arrangement of information on the interface and the progression of tasks, and the remembering of names and use of commands, specific rules about entering commands and the ability to learn the system operations. The interface can help in propagating learning through effective warning and error messages, pop-up dialogue boxes with messages that tell users how to correct errors or go about the steps in completing certain tasks, and other similar messages. As a result, the users' abilities in learning are impacted by how to

discover and explore features, comprehend the terminologies used and the feedback when completing tasks. The interface also can be effectively used to dispense the amount of help given, positioning of help messages and the ease of access to such help whether or not online. The ACCtrav system user interface did not fare well on the foregoing factors.

The other factors noticeable in the results affecting learning or propagating the kind of learning behaviour depicted in the results emanated from user frustration with the ACCtrav system itself. Frustration may be described in relation to when the computer-based system acts in an unexpected way that aggravates users and keeps them from reaching task goals (Ceaparu et al., 2004; Lazar et al., 2005). However, there was a desire to measure the magnitude of frustration, and the relationship with which the frequent system freezes – slow speeds of operation raised feelings of frustration. A lack of interest in learning advanced features also resonated with the users finding the interface very dull, which may have affected users' mood and attitude or desire to further explore the system and its features.

The ACCtrav system interface did not have a help menu, neither were system user manuals available. Consequently, users relied on the help desk for any kind of help and support with the system. Lack of a Help menu as well as user manuals contributed towards the poor attitude on self-learning and high dependency on the IT help desk. The results showed that over 82% of the participants called the IT help desk for help three or more times per day.

Certainly, the ACCtrav system was well developed for novice users with its default lists in the drop-down menus. Anyhow, ACCtrav did not adequately help novice users advance their skills into experts. On that account, users always sought retraining from the help desk. Over and above that, the frequent system failures not only affected users' productivity, it also affected the morale to learn further because of the emotional frustration emanating from users' inability to complete tasks on time. As a consequence, users' moods and state of being were affected which in turn caused the users' inability to memorise what was passed on during the training.

The next section will be a discussion on the results in the context of user productivity. The ease with which users learn the system could have a proportionate impact on the users' productivity levels.

5.4.2 Productivity

In the past, several economists once considered services innovation through the use of technology to be the most effective means for raising productivity (Baily and Chakrabarti, 1988; Cyert and Mowery, 1989; Klein, 1988). Although such assertions would have been applicable many decades ago, the researcher acknowledges that there is still relevance to the contemporary computer-based systems with regard to user productivity. Nowadays, people expect to simply work on or use systems without prior reading, and certainly, with no training. There was compelling evidence in the results that the ACCtrav system did not effectively bring about the anticipated overall and key beneficial effects on user productivity. For example, all the participants expressed the desire to have the ACCtrav system just simply working. The results showed that 48% of the participants were often frustrated when encountering difficulties with the ACCtrav system; on the other hand, 37% did not know what step to take next; and 15% felt irritated (see table 9 or figure 17). The results confirmed that computer problems and the resultant frustration were common among computer-based system users (Ceaparu et al., 2004; Lazar et al., 2005). In this case, the participants linked the causes of frustration to tiresome delays when the ACCtrav system froze or crashed, was slow in its response to most transactions, gave incomprehensible error messages or no feedback at all, and the lack of appropriate system warning messages about potential problems during operations (Lindgaard et al., 2011; Tractinsky et al., 2006), which often took up with it work time (Cyr, 2008; Sonderegger and Sauer, 2010; Quinn and Tran, 2010). Some of the dialogue boxes were written in an unclear style, with confusing error messages which hardly gave users a clue on the root causes of the problems encountered or steps to be taken out of the problem. Such challenges confirmed waste of users' productive time (Lazar et al., 2005).

Secondly, a well-designed user interface would have facilitated and enabled users to easily interact with the ACCtrav system. As a result, there would have been a well-facilitated self-learning or quicker task completion. This would have an impact on

productivity due to easier and/or better system navigation because a user interface supports the way users work, communicate and interact in their everyday and working lives (cf. interaction design definition, Preece et al., 2011). A well-designed system user interface also reflects how well designed, effective, and simple the structure of the business processes, tasks and activities are. Considering the following results about the system user interface, about two-thirds of participants (66.7%) found the system user interface satisfactory and easy to use as compared to 11.1% who had difficulties with the system. Additionally, 85.2% of the participants indicated finding the screen characters easy to read. About 88.9% of participants acknowledged adequate display of information on the screen interface, and 63% found the information logically arranged. The researcher should have concluded from the above results that appropriate information that displays on the system interface was critical for better user performance (Johnson et al., 2005). Hence, better productivity when compared to the results showed that 74.1% of the participants had reported a clear sequence of screens, and 59.3% found it easy navigating the ACCtrav interface, while 66.7% was on progression of work-related tasks.

However, on the aesthetics factor, up to 37% expressed finding the ACCtrav system user interface dull, 22.2% found it stimulating, while 40.7% did not know what to say about it. This meant that 77.8% considered the interface either dull or did not know what to say of the screen's aesthetics. Further probing of these views revealed intriguing patterns on tasks and user performance. The pattern analysed revealed a comprehension that not only does correct information from the system provide for a better platform to make appropriate decisions, but the beauty of the screen offers a feeling and perception of easy tasks. Such a perception in a user's mind would help boost the confidence within them; this will likely impact on productivity. The poor design of ACCtrav interface in this case was associated to contributing to user productivity concerns, most especially on the menu layout, widgets, display of error messages and instructions to correct errors, and use of features or shortcuts. For example, users who had worked with the ACCtrav system for a long time experienced challenges that affected the ability to maximise levels of productivity when attempting shortcuts to tasks or specific information. Here were some of the noticeable challenges stated: "Everything is drop-down, which means scrolling

through the entire list to select what you are looking for.” “It should have a function whereby you can display or call up all hotel properties in an area, say a city (display all hotels/guesthouses loaded under say JNB/CPT, etc.).” Some of the remarks were in relation to users not having the ability to link back from the system to other relevant information such as probing of ticket ranges. In this instance, users often browsed separately out of the system for information, which seemed to be an extra task step that could have been integrated within the ACCtrav system as either a search command option or link (Carroll, 2013).

The researcher acknowledges that some of the productivity challenges could have emanated from other sources that HCI processes and methodologies may not help address. For example, slow operating speed and freezing in the middle of tasks could be related to a depreciated computer network infrastructure, or interconnectivity – available bandwidth, and possibly, server system configurations.

5.4.3 Business processes and/or workflows

Well-designed processes and or workflows not only put in place clear, analysed and formally described tasks but also lead to improved efficiency for systems’ operations (Carroll, 2013). Automating business processes, however, may not necessarily result in the elimination of the many unnecessary steps taken when accomplishing tasks. Automating tasks may neither bring about better process control that could help improve on the management of business processes that are achieved through standardising working methods and the availability of audit trails.

In the case of ACCtrav, the effectiveness of the business processes were measured on items that showed whether or not tasks could be performed in a straightforward manner, the number of steps taken per task, steps to complete a task followed a logical sequence, and whether users could accomplish tasks knowing only a few commands. The clearer the above factors were to users, the likely would be the effectiveness of the processes already put in place.

5.4.4 Branding, communication, business values and publicity

While analysing the results, the researcher sought to relate the findings to reflect on the intangible benefits such as branding, communication, shared values, and publicity. As much as these factors were subjective in their own nature, any computer-based system should facilitate propagating them within the business. The researcher based on inferred reasoning from the results to show how the ACCtrav system may have worked in this regard. The approach used by the researcher was to relate user reactions on various QUIS items to reflect on the likely impact on branding, communication, shared values and publicity for the business. The researcher acknowledges, though, that the QUIS did not give any means of directly measuring these factors for the ACCtrav system. However, the fact that there were significant levels of frustration amongst users concerning ACCtrav was one likely sign of difficulties that the business was faced with in communication, sharing values, and publicity because frustrated users of the system would likely behave or take desperate measures which would not conform to the business norms. With over one-third (37%) of participants rating the ACCtrav system as terrible meant that up to 37% of the service that the business offered was terrible as well. Also, it could turn out to be interpreted that the business was affected negatively to this level regarding its publicity and branding.

Frustration amongst ACCtrav users was as high as 44.4% of the participants. At this rate, it could also mean that the communication system in place was very poor. Frustrated users cannot communicate willingly and effectively. Business values are not adhered to when rendering a service to customers because a frustrated user will not think appropriately in that moment of frustration; the user will not mind values, and therefore, will not make appropriate decisions. It may also mean that an equal percentage of customers were frustrated or dissatisfied with the service rendered to them.

5.5 Conclusion

The discussion in this chapter was focussed on analysing and interpreting data collected to give insight on whether or not the challenges indeed encountered by the users of the ACCtrav system were HCI related. The results were interpreted in four

areas of context: training and skills enhancement; user productivity; business processes; and branding, communication, sharing values and publicity.

The results showed an indication of, among others, user frustration due to inadequate understanding of how to operate ACCtrav, slow response transactions, as well as frequent system failures. The ACCtrav system was clearly designed with novices in mind and did not consider experienced users, especially in aspects of quickening tasks through the use of shortcuts and commands. The ACCtrav system interface does not cater for users who would prefer self-learning in order to advance their knowledge of the system.

Also discussed in the chapter was the structure of tasks, whether or not tasks had an adequate number of steps to take; whether steps followed a logical sequence; and if feedback was provided on completing the steps. Other areas of interest included the facilitation of users learning the advanced features in the system, the ability to correct mistakes, undo operations, and the reliability of the ACCtrav system.

It was clear that HCI processes and methodologies still have a significant role when developing contemporary computer-based systems. The effects can be noticed in user experience, the ease of learning, the structure of tasks and processes, communication and social interaction. The next chapter, Chapter 6, contained the summaries about the findings and conclusion drawn from the study.

CHAPTER 6: SUMMARY AND FURTHER RESEARCH

6.1 Introduction

The discussion in this chapter covers a review and summary of all the major conclusions from the previous chapters; including the review and summary of the methods used. The research topic for this study was: *What benefits can a business derive from HCI Interventions?* The research question was subdivided into three sub-questions: (1) What are the usability problems faced by the users while accomplishing tasks using the ACCtrav system? (2) How do these usability problems affect business in this case? (3) What HCI techniques can be applied to correct these usability problems? The sub-questions were a guide when conducting the literature review (Chapters 2 and 3), and they helped to select the research design and data collection methods used (Chapter 4). The case study approach was applied as a research design, and the study used the interpretivist research paradigm approach when collecting, analysing and interpreting the data. A questionnaire, observation, interviews and field notes were used as data collection methods.

This chapter starts with the review of the problem statement, which includes the objectives, in Section 6.2; a discussion in Section 6.3 reflects on the methods used whereas the summary of the research findings arranged according to the research sub-questions in Section 6.4. Section 6.5 contains a discussion on a selection of the most important conclusions arrived at in this study. The conclusions provide the answers to the main research question. A summary of the major contributions of the study appear in Section 6.6. In Section 6.7 the recommendations for implementation of the proposed guidelines are discussed, and Section 6.8 contains the concluding remarks for the chapter as well as for the whole dissertation.

6.2 The problem statement

The study focussed on the ACCtrav system used in a travel management company which provides travel services to other corporates, including government departments. The ACCtrav system was implemented to help in the efficient capture of travel data and provide for more efficient and effective travel expense reporting on all customer accounts. To achieve efficiency in expense reporting, most of the manual tasks at the time had to be accomplished using a computer-based system.

The ACCtrav system's functionality and features were then conceptualised and aligned in such a way as to (a) speed up service provision; (b) broaden service capacity through higher availability and performance; and (c) provide for better security through trustworthy auditing of all the transactions. Nevertheless, over a number of years, the objectives of implementing the ACCtrav system had not been adequately realised. The users had challenges working with the system, and these challenges seemed to impact on the business in terms of the quality of the service provided.

6.3 A reflection on the methods used

The goal of this study was to ascertain the benefits that the TMC could derive from implementing the HCI interventions during the development and or implementation of ACCtrav. To achieve the goal, the challenges that users of the ACCtrav system encountered had to be identified and understood in terms of how such challenges affected the business; and then those challenges related to the solutions offered by HCI techniques.

The questionnaire for user interface satisfaction (QUIS) was used to achieve the goal of this study. However, it was found that the QUIS was not the most optimal method of collecting data to measure tangible benefits that can be derived from implementing HCI interventions for a business. Data collected from the QUIS can only be analysed to reveal the intangible benefits associated with a usable system.

Nevertheless, the QUIS has notable advantages as shown by the following benefits associated with its use:

- It is a widely used instrument and therefore its validity has already been established by other researchers (Umd, 2012)
- It was easy to use, and all the participants were familiar with filling in a questionnaire of this format. So there was no need for prior training.
- It was quick to analyse the information.

The selection criterion of the participants was based on their willingness to volunteer for participation in the study at their own workplace settings. The participants were therefore a convenience sample; however, future work may have to consider specific factors when selecting participants such as specific population segments, age groups, professions, educational or cultural backgrounds, and gender.

6.4 A summary of the findings

The subsequent sections contain summarised discussions on the findings arranged according to the three research sub-questions: section 6.4.1 provides a summary of the usability problems that ACCtrav users encountered when accomplishing tasks; section 6.4.2 covers the summary of the suggested challenges that affected business as a result of the usability challenges; and lastly, in section 6.4.3 is a discussion of the suggested HCI techniques that may have been used to address the usability challenges.

6.4.1 Sub-question 1: What are the usability problems faced by the users while accomplishing tasks when using the ACCtrav system?

About two or three decades ago system user interface standards were the object of intense activity during the software development (Abernethy, 1993; Norman, 1988); which included work in the International Standards Organization (ISO). The activities became part of a general interest in information processing standards among the IS researchers (e.g. Landauer, 1996), and as a result, there grew a belief that consistency in the user interface design was one of the most important usability considerations (Nielsen, 1993; Preece et al., 1994).

The consistency of the contemporary software development in the system user interface does not only promotes system usability, but has a diverse effect on the profitability of businesses that use such systems (Bias and Mayhew, 2005; Carroll, 2013; Donoghue, 2002). Given the importance of usability standards, it was reasonable to study the ACCtrav system to ascertain whether businesses have an understanding of the benefits associated with following the usability standards when developing or acquiring computer-based systems.

When analysing the data collected in the case of ACCtrav, there was evidence that indicated the existence of usability problems in the system interface. The results showed that only 48% of the users of the ACCtrav system regularly found the information they were looking for the first time (an additional 11% sometimes “found” the information after two or more tries). Some of the participants (44.4%) acknowledged that the ease with which they operated the ACCtrav system depended upon the user’s level of experience and 66.7% participants did not feel

encouraged to learn and/or explore advanced features of the ACCtrav system through trial and error (Ceaparu et al., 2004; Lazar et al., 2005).

Before elaborating on how usability challenges affect business, the most notable usability challenges identified in the ACCtrav system interface included use of shortcuts not provided for experienced users; reliance on drop-down menus in the user interface design; lack of online Help and documentation for users to consult; inadequate informative feedback and progress on task completion; lack of appropriate and clear error and message handling; reversal of actions not facilitated in the order to correct mistakes with immediate effect; frequent system failures which occurred at an average of once in two days; and insufficient support for user sense of control, that is, supporting internal locus of control. Users always relied on the help desk for support due to the inadequate design of dialogues to yield closure in ACCtrav.

6.4.2 Sub-question 2: How do these usability problems affect business in this case?

The experience gained from this study shows that following a checklist of specified design elements and rules, as stated in the usability standards, helps in conforming to the quality assurance review of computer-based systems (Preece et al., 2011; Sharp et al., 2007). However, for businesses to achieve the intended quality assurance and derive the benefits, they have to develop the ability to emphasise the use and understanding of the usability standards (Diaper, 2004; Dumas, 2003; Nielsen, 1993). This is because the development of usable systems does have an impact on the achievement of the business goals such as reducing costs, improving productivity, and providing an efficient and effective service to customers (Diaper, 2004; Myers, 1992) - which may result in a predictable revenue inflow (Bias and Mayhew, 2005; Landauer, 1996).

In the case of ACCtrav the areas that were affected included (a) user productivity, (b) learning and skills enhancement, (c) publicity, and (d) loss of revenue due to mistakes made by the users. Table 9 provides a summary of the business areas that were affected as a result of usability problems.

Table 8: How usability problems affect the business

Area of interest	How the business is affected
Users/Employees	<p>Usability challenge cause users to become frustrated, develop low morale, lack enthusiasm and satisfaction in their work (Bessie`re et al., 2005). As a result the business is affected in the following ways</p> <ul style="list-style-type: none"> • low productivity as a result of poor satisfaction and lack of engagement when accomplishing tasks (Diaper, 2004). Business never operates at optimal levels hence potential capacity never achieved; • the need for regular training (training costs); • poor interpersonal relationships, collaboration and communication. Communication from top management does not flow through well to the lowest user (Bessie`re et al., 2004).
Costs/Expenses	<p>The company spends more to</p> <ul style="list-style-type: none"> • train users to develop the skills needed to accomplish tasks efficiently; • maintain the ACCtrav system; • advertise when building brand.
Publicity and Revenue	<p>Bad publicity arises from the fact that users cannot reach their task goals on time hence poor service delivery from the business. This leads to loss of revenue of as a result of substandard service rendered, in the form of reimbursing customers and or suppliers for the mistakes made by the consultants; and the inability to win new customers and or retention of existing customers.</p>

There was evidence of low productivity among users as a result of frustrating experiences that they encountered when working with ACCtrav (BCDtravel, 2010; Ceaparu et al., 2004). Other factors that affected user productivity included (a) user's low enthusiasm; (b) poor satisfaction; and (c) lack of engagement and trust when accomplishing tasks (Bessie`re et al., 2005; Cyr et al., 2007). Low productivity levels causes business to perform below the potential capacity. Low morale among the users of ACCtrav affected their interpersonal relationships, collaboration and communication, and it kept them from reaching their task goals (Lazar et al., 2005).

There was also an increased need for regular end-user training on how to operate the ACCtrav system. Of the calls received by the support help-desk 90% sought help on ACCtrav. Business is affected by the increase in training costs, support costs and system maintenance.

From the survey of customers, 68.7% were not happy with the service rendered (BCDtravel, 2010). Customers complained of not receiving the services on time, and often, without all the stated requirements. Owing to long turnaround times to fulfil the orders or to the substandard service rendered, business suffers from bad publicity which, in the long run, causes loss of revenue due to unplanned frequent discounts offered on fees to aggrieving customers, and the inability to retain or win new customers. In addition the company's public relations cost more when building the brand or image because of the increase in advertising expenses to reach new markets.

6.4.3 Sub-question 3: What HCI techniques can be applied to correct these Usability problems?

Many HCI techniques were not investigated, however, those listed below are the ones considered to be most suitable for this study's goal of (a) improving user productivity; (b) reducing the costs of training; (c) enhancing skills among users; (d) redefining business processes or work flows to generate a competitive advantage; and (e) improving business operations (Bias and Mayhew, 2005; Magoulas and Chen, 2006). The HCI techniques that were investigated are as follows:

- *Contextual Inquiry and Task Analysis*: Through silent observation and one-on-one interviewing, business would gain an understanding of the task-flow users make use of to achieve their task goals (Carroll, 2013; Bessie`re et al., 2005).

As a result, business would be able to identify areas of the task process that may need to be enhanced to speed up the task completion process (Tractinsky, 2012).

- *Attention and Workload Model*: The attention and workload model considers the user's attention span and concentration based on the environment of use, and the perceived mental workload involved in completing a task.
- *Human Information Processing Model*: Helps improve the capacity and efficiency of working/short-term memory by repeating or rehearsing the steps to complete a task; which can be achieved by the user recalling or recognising the steps to follow when completing tasks (Preece et al., 2011). However, the accuracy of recall may be based on the environmental conditions at the time of encoding at first encounter (Tractinsky, 2012).
- *User-Centred Design (UCD)*: The UCD technique would help businesses decide when and how to involve users and user interface design specialists in the design and development process (Preece et al., 2011; Porat and Tractinsky, 2012); How to address accessibility difficulties for a product to be universal - universal usability (Lazar, 2007; Shneiderman and Plaisant, 2009).
- *Goals, Operators, Methods, and Selection Rules (GOMS)*: GOMS would help examine the individual components of a user experience in terms of the time it takes to complete a task most efficiently.
- *Cognitive Walk-through*: Usability experts "walk" through a set of the user tasks considering users' behaviours in the form of (a) trying to achieve the right effect; (b) the user noticing whether or not the correct action is available; (c) associating the correct action with the effect to be achieved; and (d) if the correct action is performed, whether the user can see that progress is being made toward the completion of the task.
- *Heuristic Evaluation or Usability Audit*: This would conduct the visibility of the system to provide users timely and appropriate feedback about the system's status in the form of displaying a progress bar and/or estimated time the system may take to load so users know what to expect (Tractinsky, 2012). Heuristic evaluation could also help match the ACCtrav system and the real world to enable a user's language in terms and concepts familiar to the user. The information is organised naturally and logically based on what users are

accustomed to in their work context/world. The result could therefore be emphasising user control and freedom as they interact with the system by allowing the functionality to undo and redo actions, and also to easily exit the system. User controls, icons, terminology, and error messaging become consistent throughout the interface. Where appropriate, industry and platform standards can be applied in the system interface.

Table 10 provides a summary of the three research sub-questions. In the left column, is listed the usability challenges that were identified when users operated the ACCtrav system. The middle column contains a brief explanation on how each usability challenge affected business, and the right column lists the HCI techniques considered suitable for correcting the usability challenges identified to bring about the benefits for business.

Table 9: Usability problems identified, their impact on business and the recommended HCI techniques that can be used to correct usability issues identified

Usability problem identified	The impact on business	HCI techniques that can be used to correct the usability problem
1. Use of shortcuts not provided for experienced users	<ul style="list-style-type: none"> – The use of shortcuts can improve on the workflow of users, making it faster, simple and easier to get the tasks done. – Navigating the system interface may become easier; which may help users to quickly find their way around the tasks. A lack thereof may result in low productivity levels causing the business to perform below its potential capacity. 	<ul style="list-style-type: none"> – Contextual inquiry and Task Analysis.
2. Reliance on drop-down menus in the user interface design	<ul style="list-style-type: none"> – Experienced users often felt bored browsing the list to select an option and some users selected wrong options. This amounted to double work when making corrections. As a result, the efficiency of completing tasks is affected. Also there is a greater possibility of users either forgetting or having memory overload as the user has to remember all the menu levels and steps to scroll for the selection. This also impacts on user performance should there be too many options to choose from. This may leave a user overwhelmed by the decisions they have to make and lead to some frustration before completing the task. 	<ul style="list-style-type: none"> – Attention and Workload Model. – Human Information Processing Model

3. Inadequate informative feedback and progress on task completion	<ul style="list-style-type: none"> - So much is spent on training users to improve their skills level and competence. Much time is spent consulting with the help-desk on cases that would be simply explained in the documentation. - Frustrated users lead to low user enthusiasm, satisfaction and engagement in their work - Low morale among the users of the system affecting interpersonal relationships, collaboration and communication 	<ul style="list-style-type: none"> - User-Centred Design - Goals, Operators, Methods, and Selection Rules (GOMS) - Cognitive walk through - Heuristic Evaluation, or Usability Audit
4. Lack of appropriate error and message handling	<ul style="list-style-type: none"> - Increased need for regular end-user training on the system - Complaints from customers as a result of long turnaround times to fulfil the orders, and or the rendering of substandard service. 	
5. Reversal of actions not facilitated in the order to correct mistakes with immediate effect		
6. Insufficient support for user sense of control (support internal locus of control). Users always rely on the help-desk for support. Inadequate design of dialogues to yield closure		
7. Frequent system failures		
8. Lack of Help and documentation for users to consult.	<ul style="list-style-type: none"> - Lack of consistence in guidelines - Variation of information provided to customers 	<ul style="list-style-type: none"> - Help and Documentation

6.5 Conclusion of the findings

The understanding and practices of HCI techniques are still subject to the awareness and knowledge availability in the industry sector in question despite the proliferation of computer-based systems. The researcher believes businesses can derive benefits from implementing HCI interventions in areas such as: (a) redefining task/workflow processes; (b) improving the means of communication (Vicari et al., 2007); (c) reaching out to new markets by enhancing existing products or creating new products and services that are effective; (d) increasing productivity levels as a result of skilled users or easy to use system interface designs or clear and simple tasks; and (e) the implementation of business strategies and goals. Sections 6.5.1 to 6.5.6 below contain brief discussions on the important conclusions arrived at in the course of this study; whereas Table 11 lists the summary of the benefits derived from using HCI interventions by the business.

6.5.1 Learnable systems

It is imperative to have systems that users can learn easily. Using HCI techniques to assess the usability of the system user interface can help business implement systems that users can learn easily, and which accommodates both novice and expert users. To achieve this 'learnability' goal the ACCtrav system interface should be designed to incorporate use of help menus or online user manuals, and should make use of keyboard shortcuts to speed up access to some tasks or commands. Also needed is a clear display of instructions and straightforward error messages to guide the user when recovering from mistakes, or help the user learn the system with minimal training.

Use of keyboard short-cuts in the ACCtrav system interface should encourage the user to learn the system's advanced features. As a result, the user becomes skilled, and costs on re-training are reduced because the user can find the way around the interface easily and quickly or can remember the steps to take to complete tasks with minimal effort.

6.5.2 User satisfaction and motivation

Users get frustrated because of the problems they encounter using computer-based systems and their need to achieve the set goals are therefore affected. Frustration affects the attitude and mind-set of the user (Bessie`re et al., 2004) and the user

experience (Ceaparu et al., 2004). The HCI interventions can help improve the user experience by having a system offer relevant services which operates in a way that suits the user's needs and expectations. For example, when the system provides meaningful feedback to the user, there is a tendency from users to enjoy their work and a desire to contribute ideas to better the experience. A bad user experience affects how users engage with each other and impacts on their emotional connection with the company; that in turn influences how the user exerts greater discretionary effort to the tasks at hand (Bessie`re et al., 2004).

6.5.3 Increase in user productivity levels

The HCI techniques help develop clear, simple, and easy-to-comprehend tasks that users can manage with ease. Consequently, the user's performance improves, and the productivity level rises, businesses then reap the most on this improved productivity as users deliver more as a result of efficient and effective systems (Diaper, 2004; Sharp et al., 2007).

6.5.4 Operational and training costs

Operational costs drop because of (a) streamlined and clear tasks/workflows; (b) the reduction in training and support costs as a result of learnable systems; and (c) the increase in user productivity levels when the efficiency and effectiveness of business processes become enhanced (Bias and Mayhew, 2005; Mele and Polese, 2011).

6.5.5 Customer satisfaction

The HCI interventions help streamline the workflows and can make it easy to detect problems in the course of fulfilling an order. Also, users better understand the requirements as a result of the clear tasks put in place and the roles in which they get involved when processing the order. The outcome of this is the shortened turnaround times fulfilling orders from when the order is placed by the customer to its delivery.

Table 10: Benefits derived from HCI interventions

Business benefit	Explanation
Changing the organisation culture	The HCI activities can be used to promote the change in culture within an organisation. The organisation can effectively drive new ways of how things are done without necessarily implementing drastic measures by incorporating HCI activities into the corporate culture. The interaction and involvement of people gradually leads to a change in ways of doing things.
Good publicity	The HCI activities can be a source of good publicity for an organisation through the press. Innovation is the key, and every organisation yearns for innovation. The HCI promotes innovation user experience. As more staff have a positive user experience, they become more productive and creative, which leads to better performance.
Customer interaction and involvement	Customer relationship management: After participating in HCI activities, customers can cite an improved, if not better, opinion of the company and offer greater loyalty in return, which is not surprising from a relationship-building perspective.
Goals	Most companies have goals at several levels, including corporate-level goals and departmental-level goals. Incorporating HCI activities and achievements into multiple levels of goals is an effective strategy for raising awareness about the company goals such as increasing customer acquisition, retention and loyalty. The HCI can be used to align departmental goals with the corporate goals.
Efficient and effective communication	Misunderstandings and silos can occur within organisations due to different groups using different terminology. HCI activities can help in understanding the internal customer requirements and better and appropriate communication means can be deployed.
Well-defined value system	The HCI can be used to understand the value system of the stakeholders and to translate how HCI supports their value system. This can be demonstrated through the product design.
Rewards and bonuses	Related to goals are bonuses. In most companies, bonuses are awarded based on the achievement of explicit goals. HCI activities can help determine appropriate rewards and bonuses as they will in some way help in collecting reliable data and also help improve employee productivity and performance.

6.5.6 Effective communication and publicity

Publicity starts within the business setting, especially amongst the staff. Clear and straightforward tasks, workflows and processes lead to well-defined roles and functions within the business. As a result, misunderstandings and silos can be easily identified and eradicated. A satisfied and motivated user will speak well of his/her job and will exhibit good interpersonal relationships. A satisfied and happy customer can willingly spread a good word about the quality of service rendered.

6.6 Summary of the contributions made by the study

The major contribution of this study is the spread of awareness about the benefits that businesses can derive from implementing HCI interventions. The awareness has been demonstrated by identifying the links between the HCI variables and factors that are critical for successful implementation of computer-based systems in areas that can help business succeed and make good return on investment (ROI)(Bias and Mayhew, 2005; Heppner et al., 2005). For example, the principle of learnability emphasises improving users' skills and knowledge (Preece et al., 2011) by: (a) making the navigation of the system easy for users (both novice and experts); (b) making it easy to recall steps to take when accomplishing tasks; and (c) making the system interface display clear and informative message dialogues and error messages that can guide a user to recover from mistakes. The other areas that this study sought a link for business success are: (d) to increase user satisfaction and motivation; (e) to have an effective public relations plan or method in place; with (f) an efficient and effective communication system (Mele and Polese, 2011).

6.7 Recommendations for implementation

The researcher has learnt that implementing HCI interventions successfully can depend on various business factors. In this study, the notable factors include creating awareness and the recognition with the involvement of top management. It is important that users of the computer-based systems attain some degree of awareness and knowledge on HCI factors and possess the ability to distinguish these factors from the traditional IT activities. Business can achieve this by employing a Usability Consultant who should serve in a senior advisory capacity within the organizational structure. Top management should recognise and get

involved in spreading awareness by creating a viable atmosphere in which key decisions can be made easily to facilitate and influence the implementation of HCI interventions. If possible, both employees and customers should also be involved in the HCI activities. Support from top management can emphasize the importance of HCI interventions in attaining business goals to the rest of the staff. Sections 6.7.1 and 6.7.2 contain brief discussions on the recommendations that the researcher believes businesses should have in place when implementing HCI interventions so as to derive and maximise their intervention benefits.

6.7.1 Adoption of HCI standards

The HCI guidelines and standards should be adopted in workplaces just like other standards and regulations such as fire safety, quality assurance, and others. Fire safety and quality assurance might be legal requirements; however, I believe that HCI (usability) standards should be treated equally since they can help in improving on the health of users. For example, the reduction of frustrating experiences that users encounter from unusable systems may have an effect in improving their health. Besides, business would benefit by having reduced absenteeism from employees who call in sick, and or their ensuing medical expenses due to more motivated and satisfied users who love to do their work.

6.7.2 Make changes regularly to the system user-interface

The system interface should be re-evaluated every two or three years. When necessary the system interface should be redesigned to reflect the change in the company's profile, technological and/or business developments.

6.8 Conclusion

This study sought to understand if HCI interventions were still relevant in evaluating the usefulness of computer-based systems and the benefits that businesses can derive from using the HCI techniques (Bias and Mayhew, 2005; Wild, 2010). The industry sector used to gain this understanding was that of travel services. By the end of this study it was clear that HCI interventions have an important role in the design and development of contemporary computer-based systems just as it was many years back (Abernethy, 1993; Norman, 1988). Therefore, the researcher upholds that HCI interventions can be used in the analysis of business processes, such as in: the way tasks can be designed; learning how

users communicate and interact in their working environments (Carroll, 2013, Heppner et al., 2005; Preece et al., 2011); evaluating user experience; the ease with which users learn systems; the structuring of the users' tasks; and influencing user communication and social interaction (Bessière et al., 2005).

Specific and focused HCI interventions put greater emphasis on the understanding of user behaviours and the characteristics of the systems used and/or the behavioural consequences of aesthetic evaluations from the user perspective when contextualised in: (a) the type and significance of tasks; (b) user experiences; (c) overall satisfaction; and (d) performance (Carroll, 2013, Tractinsky 2012). This can help business to determine how to: (1) utilise resources effectively; (2) monitor and measure the quality of services; and (3) predict future events, conditions, and customer demand (Kim 2009; Mele and Polese, 2011).

Nonetheless, it is important that the knowledge and awareness of HCI interventions is emphasised by business when creating a manageable design process that can bridge the gap between the marketing and operations of services. The bridging of the marketing and operations gap can lead to business benefits such as: (a) higher revenues through increased sales; (b) increased user productivity and satisfaction; and (c) reduced support costs (Chen et al., 2009; Cyr et al., 2007; Luthria and Rabhi, 2009; Magoulas and Chen, 2006; Papazoglou and van den Heuvel, 2007; van Dijk et al., 2007).

REFERENCES LIST

- Abernethy, B. (1993). Searching for the minimal essential information for skilled perception and action. *Psychological Research*, Springer-Verlag. Volume 55, Issue 2, Pages 131-138.
- Alexander, D. (2006). Usability and Accessibility: Best Friends or Worst Enemies? Retrieved 18 August, 2011:
http://www.valaconf.org.au/vala2006/papers2006/99_Alexander_Final.pdf.
- Andersen, B. (1999). *Business Improvement Toolbox*. Milwaukee, WI: ASQ Quality Press.
- Baily, M. & Chakrabarti, A. K. (1988). *Innovation and the Productivity Crisis*. Washington D.C.: The Brookings Institute, Washington, D.C.
- Batt, P.J. (2008). Building social capital in networks. *Industrial Marketing Management*. Elsevier. Volume 37, Issue 5, Pages 487–491
- BCDtravel. (2010), Retrieved 19 March 2012:
http://www.BCDtravel.co.za/aw/home/SouthAfrica/en-ZA/Home/~byzc/Information_Center/~bmk/Research_Reports_White_Papers/sur_sal2009b.pdf.
- Berry L.L. & Parasuraman, A.A. (1993). "Building a New Academic Field - The Case of Services Marketing", *Journal of Retailing*, Vol.69, Issue.1, Pages.13 - 60.
- Bessie`re, K., Ceaparu, I., Lazar, J., Robinson, J., & Shneiderman, B., (2004). Social and psychological influences on computer user frustration. In: Bucy, E., Newhagen, J. (Eds.), *Media Access: Social and Psychological Dimensions of New Technology Use*. Lawrence Erlbaum Associates, Mahwah, NJ, Pages 91–103.
- Bessie`re, K., Newhagen, J., Robinson, J., & Shneiderman, B. (2005). A model for computer frustration: the role of instrumental and dispositional factors on incident, session, and post-session frustration and mood. *Computers in Human Behavior*.
- Billé, R. (2010). Action without change? On the use and usefulness of pilot experiments in environmental management. *SAPI EN. S. Surveys and Perspectives Integrating Environment and Society*, (3.1).
- Blanche, M. J. T., Blanche, M. T., Durrheim, K., and Painter, D. (Eds.). (2006). *Research in practice: Applied methods for the social sciences*. Juta and Company Ltd.

- Blankson, C. & Kalafatis, S.P. (1999) Issues and challenges in the positioning of service brands: a review, *Journal of Product and Brand Management*, Vol. 8 Iss: 2, pp.106 – 118
- Boehm, B. & Turner R. (2003). *Balancing Agility and Discipline: A Guide for the Perplexed*. Addison wesley
- Boehm, B.W. (1991). Software risk management: Principles and practice. *IEEE Software*. Volume 8, Issue1, Pages 32–41.
- Bourges-Waldegg, P. & Scrivener, S.A.R. (1998). Meaning, the central issue in cross-cultural HCI design. *Interacting with Computers*, Pages 287-309
- Cai, S., Xu, Y., & Yu, J. (2008). The effects of web site aesthetics and shopping task on consumer online purchasing behavior. *CHI 2008 Proceedings*, (pp. 3477-3483). Florence, Italy.
- Carroll, J.M. (2009). *Conceptualizing a possible discipline of human computer interaction*, Pennsylvania State University
- Carroll, J.M. (2013): Human Computer Interaction - brief intro. In: Soegaard, Mads and Dam, RikkeFriis (eds.). "The Encyclopedia of Human-Computer Interaction, 2nd Ed.". Aarhus, Denmark: The Interaction Design Foundation. Retrieved 14 April 2013: http://www.interaction-design.org/encyclopedia/human_computer_interaction_hci.html
- Ceaparu, I., Lazar, J., Bessie`re, K., Robinson, J., & Shneiderman, B.,(2004). Determining causes and severity of end-user frustration. *International Journal of Human-Computer Interaction* Volume 17 Issue 3 Pages 333–356.
- Chamorro-Koc M., Vesna, P, & Emmison, M. (2009): Human experience and product usability: Principles to assist the design of user–product interactions. *Applied Ergonomics*, Volume 40, Issue 4, Pages 648-656
- Chen, J.V., Yen, D.C., & Chen, K. (2009). The acceptance and diffusion of the innovative smart phone use: a case study of a delivery service company in logistics. *Information and Management* Volume 46, Issue 4, Pages 241–248.
- Cockton, G. (2006). Designing worth is worth designing. *NORDICHI 2006*. ACM, Oslo, Pages 165–174.
- Cottam, H., & Leadbeater, C. (2004). *Health: Co-creating Services*. Report, RED: Design Council, London.
- Cross, R., Borgatti, S.P., & Parker, A. (2001). Beyond answers: dimensions of the advice network. *Social Networks Elsevier* Volume 23, Pages 215–235

- Cyert, R. M. & Mowery, D. C. (1989). Technology, employment and U.S. competitiveness. *Scientific American*, Volume 260, Issue 5, Pages 54-62.
- Cyr, D. (2008). Modelling Website Design across Cultures: Relationships to Trust, Satisfaction and E-loyalty. *Journal of Management Information Systems*, Volume 24, Issue 4, Pages 47-72.
- Cyr, D., Hassanein, K., Head, M., & Ivanov, A.. (2007). The role of social presence in establishing loyalty in e-service environments. *Interacting with Computers* Volume 19, Issue 1, Pages 43–56.
- Cyr, D., Head, M. & Ivanov, A. (2006). Design Aesthetics Leading to M-loyalty in Mobile Commerce. *Information and Management*, Volume 43, Issue 8, Pages 950-963.
- Cyr, D., Head, M., & Lario, H. (2010). Colour appeal in website design within and across cultures: A multi-method evaluation. *International Journal of Human-Computer Studies*, Volume 68, Issue 1, Pages 1-21.
- Darby, M.R. & Karni, E. (1973). “Free competition and the optimal amount of fraud”, *Journal of Law and Economics* Volume 16, pages 67-86
- Darzentas , J. & Miesenberger, K. (2005) Design for All in Information Technology: A universal Concern. in Anderson, K. V., Debenham J. and Wagner, R. (Eds.) *Lecture notes in Computer Science*. Springer verlag.
- De Villiers, M.R. (2005). Three approaches as pillars for interpretive information systems research: development research, action research and grounded theory. *Proceeding in SAICSIT '05 Proceedings of the 2005 annual research conference of the South African institute of computer scientists and information technologists on IT research in developing countries*. Pages 142 – 151
- Diaper, D. (2004) Understanding task analysis for human–computer interaction. In: Diaper, D., Stanton, N.A. (Eds.), *The Handbook of Task Analysis for HCI*. LEA, Mahwah, Pages 5–47.
- Dix, A., Finlay, J., Abowd, G. D. & Beale, R. (2004). *Human Computer Interaction*, 3rd ed. Harlow, UK: Addison-Wesley
- Dix, A., Finlay, J., Abowd, G.D & Beale, R. (2004) *Human-Computer Interaction*. Third Edition. Harlow: Pearson Education Ltd.
- Donoghue, K. (2002). *Built for Use: Driving Profitability Through the User Experience*. McGraw Hill Professional.
- Dowell, J. & Long, J.B. (1998). Conception of the cognitive engineering design problem.

- Dowell, J. & Long, J.B., (1989). Towards a conception for an engineering discipline of
- Drucker, P.F. (1991) *Managing for the Future: The 1990s and Beyond*. New York: Truman Talley Books/E.D. Dutton
- Dumas, J. S. (2003). User-Based Evaluation. IN JACKO, J. A. and SEARS, A. (Eds.) *The Human-Computer Interaction Handbook*. Mahwah: Lawrence Erlbaum Associates.
- Eason, K. D. (1991). Ergonomic perspective on advances in human–computer interaction. *Ergonomics*, 34(6), 721–741. efforts in services research. In: Roy, R., Shehab, E. (Eds.), *Industrial Product Ergonomics Volume 41, Issue 2*, Pages 126–139.
- Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The qualitative report*, Volume 8, Issue 4, Pages 597-607
- Golinelli G.M., Pastore A., Gatti, M., Massaroni, E. & Vagnani, G. (2002), “The firm as a viable system: managing inter-organisational relationships”, *Sinergie*, Volume 20, Issue 58, Pages 65-98.
- Gould, J.D. & Lewis, C. (1985). Designing for usability: Key principles and what designers think. *Communications of ACM*, Vol. 28, Issue 3, Pages 1-10
- Greig, A. & Taylor, J., (1999). *Doing Research with Children* (Paperback). SAGE Publications, Limited. ISBN-13: 9780761955900
- Hassenzahl, M. (2003) The thing and I: Understanding the relationship between users and product. In *Funology: From usability to enjoyment*, M.A. Blythe, K.Overbeeke, A.F.Monk, P.C. Wright, Eds. Kluwer Academic Publishers, The Netherlands.
- Henry, S. L. (2002). Another- ability: Accessibility Primer for Usability Specialists. Retrieved 19 June 2011: <http://www.uiaccess.com/upa2002a.html>.
- Heppner, C.C., Kates, J., Lynch, J.S., & Moritz, R.R., (2005) At Sprint, Understanding the Language of Business Gives Usability a Positive Net Present Value in Bias, R.G and Mayhew, D.J., (2005), *Cost-Justifying Usability, An Update for an Internet Age*, 2nd edition, Pages 601–611
- Hill, P. (1977) On goods and services. *Review of Income and Wealth* Volume 23, Issue 4, Pages 315–338.
- Hill, P. (1999) Tangibles, intangibles and services. *Canadian Journal of Economics* Volume 32, Issue 2, Pages 4–26.
- Hocova, P. & Stanicek, Z., (2010), On Service Systems – by Definition of Elementary Concepts: Towards the Sound Theory of Service Science. In: *IESS 1.0. LNBIP 53*

- Howe, K.R., (1988). Against the Quantitative-Qualitative Incompatibility Thesis (Or Dogmas Die Hard). *Educational Researcher*, Volume 17, Issue 8, Pages 10-16.
- IfM & IBM, 2008. *Succeeding through Service Innovation*. IfM, University of Cambridge, Cambridge.
- ISO 9241-210 (2010). Retrieved 25 November, 2013:
http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=52075.
- Jones T.O. & Sasser E.W. JR., (1995). Why satisfied customers defect, *Harvard Business Review*, November-December, Pages 88-99
- Jones, M. & Samalionis, F. (2008). From small ideas to radical service innovation. *Design Management Review*, Winter, Pages 19–27.
- Kaner, M. & Karni, R. (2006). A Knowledge Framework for a Service Concept. *Proceedings of I-KNOW '06*. Graz, Austria
- Karat, C. (1990) Cost-benefit analysis of usability engineering techniques. *Proceedings of the Human Factors Society 34th Annual Meeting*. Santa Monica, CA: Human Factors Society.
- Kim, H. (2009). Service science for service innovation. *Journal of Service Science*, Volume 1, Issue 1, Pages 1-7.
- Klein, L.R. (1988). Components of competitiveness. *Science*, 241,308-313. In Mokyr, J. (1990). *The Lever of Riches: Technological Creativity and Economic Progress*. New York: Oxford
- Kling, R. (2000). Learning about information technologies and social change: the contribution of social informatics. *The Information Society* Volume 16, Issue 3, Pages 217–232.
- Landauer, T. K. (1996). *The Trouble with Computers: Usefulness, Usability, and Productivity*. The MIT Press.
- Lazar J, Jones A., Bessie`re, K., Ceaparu I., & Shneiderman B. (2005). Workplace user frustration with computers: an exploratory investigation of the causes and severity. *Behaviour and Information Technology*.
- Lazar, J. (2007). *Universal Usability: Designing Computer Interfaces for Diverse users*. John Wiley and Sons Ltd, Ltd,

- Lazar, J., Meiselwitz, G., & Norcio, A. (2004). A taxonomy of novice user perception of error on the web. *Universal Access in the Information Society Journal* Volume 3, Issue 3, Pages 202–208.
- Lee, S. & Koubek, R.J. (2010). Understanding user preferences based on usability and aesthetics before and after actual use. *Interacting with Computers*. Volume 22, Issue 6, Pages 530–543
- Leedy, P. D., & Ormrod, J. E. (2010). *Practical research: Planning and design*. Upper Sadle River, New Jersey: Merrill.
- Levitt T. (1981). “Marketing Intangible Products and Product Intangibles”, *Harvard Business Review*, Issue 81, Pages 94–102.
- Levy, S. (1988). *Information technologies in universities: An institutional case study*. Unpublished doctoral dissertation. Northern Arizona University.
- Lindgaard, G. & Dudek, C., 2002, User satisfaction, aesthetics and usability: Beyond reductionism. In: *Usability gaining a competitive edge*, Proceedings IFIP 17th World Computer Congress, J. Hammond, T. Gross and J. Wesson (Eds.), Montreal, Canada.
- Lindgaard, G., Dudek, C., Sen, D., Sumegi, L., & Noonan, P. (2011). An exploration of relations between visual appeal, trustworthiness and perceived usability of homepages. *ACM Transactions on Computer-Human Interaction (TOCHI)*, Volume 18, Issue 1, Pages 1.
- Lindgaard, G., Fernandes, G., Dudek, C., & Brown, J. (2006). Attention web designers: You have 50 milliseconds to make a good first impression!. *Behaviour & Information Technology*, Volume 25, No. 2, Pages 115 – 126
- Locke, E.A. (1996). Motivation through conscious goal setting. *Applied Preventative Psychology* Volume 5 Pages 117–124.
- Lovelock, C.H. & Gummesson, E. (2004). Whither services marketing? *Journal of Service Research* Volume 7, Issue 1, Pages 20–41.
- Loyd, B. & Gressard, C. (1984). Reliability and factorial validity of computer attitude scales. *Educational and Psychological Measurement* Volume 44, Pages 501–505.
- Lund, A. M. (1997). Expert ratings of usability maxims. *Ergonomics in Design*, 5(3), 15-20. A study of the heuristics design experts consider important for good design.
- Agar, M. (1996). *Professional Stranger: An Informal Introduction to Ethnography*, (2nd Ed.). Academic Press.

- Luthria, H. & Rabhi, F. (2009). Service oriented computing in practice. *Journal of Theoretical and Applied Electronic Commerce Research* Volume 4, Issue 1, Pages 39–56.
- Maglio, P.P., Srinivasan, S., Kreulen, J.T., & Spohrer, J. (2006). Service systems, service scientists, SSME, and innovation. *Communications of the ACM - Services science*. Volume 49, Issue 7, Pages 81-85
- Maglio, P.P., Vargo, S.L., Caswell, N., Spohrer, J. (2009). The service system is the basic abstraction of Service Science. *Inf. Syst. E-Bus. Manage.* Volume 7, Pages 395–406
- Magoulas, G.D. & Chen, S. (2006). Human factors in personalised systems and services. *Interacting with Computers* Volume 18, Issue 3, Pages 327–330.
- Mantei, M.M. & Teorey, T.J. (1988). Cost/benefit analysis for incorporating human factors in the software lifecycle. *Communications of the ACM*. Volume 31 Issue 4, Pages 428-439.
- McCarthy, E. W. (1982). The REA Accounting Model: A Generalized Framework for Accounting Systems in a Shared Data Environment. *The Accounting Review*, Pages 554–78
- McCarthy, J. & Wright, P. (2004). *Technology as Experience*. MIT Press, Bradford, MA.
- Mele, C. & Polese, F. (2011). Key Dimensions of Service Systems in Value-Creating Networks in Demirkan, H., Spohrer, J.C., Krishna, V. (2011) *The Science of Service Systems*. *Service Science: Research and Innovations in the Service Economy*. Springer US. Pages 37-59
- Mele, C., Colurcio, M., & Russo-Spena, T. (2009). Alternative logics for innovation: a call for service innovation research. *Proceedings of Forum on Service: Service-Dominant Logic, Service Science and Network Theory*, Napoli. Sage
- Mentis, H. & Gay, G. (2003). User recalled occurrences of usability errors: implications on the user experience, *Extended Abstracts of the 2003 Conference on Human Factors in Computing Systems (CHI)*. ACM Press, New York Pages 736–737.
- Miles, M. & Huberman, M. (1984). *Qualitative data analysis: A source book for new methods*. Beverly Hills, CA: Sage Publications. MITIP'09 Bergamo.
- Moshagen, M., Musch, J., & Göritz, A. S. (2009). A blessing, not a curse: Experimental evidence for beneficial effects of visual aesthetics on performance. *Ergonomics*, Volume 52, Issue 10, Pages 1311-1320.

- Murrell, A.J. & Sprinkle, J. (1993). The impact of negative attitudes toward computers on employees' satisfaction and commitment within a small company. *Computers in Human Behavior* Volume 9 Pages 57–63.
- Myers, M. D. (1994). A disaster for everyone to see: an interpretive analysis of a failed IS project. *Accounting, Management and Information Technologies*, 4(4), 185-201.
- Nash, J.B. & Moroz, P.A. (1997). An examination of the factor structures of the computer attitude scale. *Journal of Educational Computing Research*. Volume 17, Issue 4, Pages 341–356.
- Nielsen, J. & Molich, R. (1990). Heuristic Evaluation of User Interfaces. Special Interest group on computer - human Interaction (SIGCHI) conference on Human factors in computing systems.
- Nielsen, J. (1993). *Usability Engineering*. Boston: Academic Press, Inc.
- NN/g (2012). Accessibility Is Not Enough. [online] Retrieved 29 December 2012: <http://www.NN/g.com>, n.d./articles/accessibility-is-not-enough.
- NN/g (2013). Introduction to Usability. [online] Retrieved 20 March 2013: <http://www.NN/g.com>, n.d./articles/usability-101-introduction-to-usability.
- Noiwan, J. & Norcio, A.F. (2005). Cultural differences on attention and perceived usability: Investigating color combinations of animated graphics. *Int. J. Human-Computer Studies* Volume 64, Issue 2006, Pages103–122
- Noor, K. (2008). Case study: A strategic research methodology. *American Journal of Applied Sciences*, Volume 5, Issue 11, Pages1602–1604.
- Norman, D. A. (1988). *The Design of Everyday Things*. London: MIT Press.
- Norman, K. (2004). *Computer Rage: Theory and Practice*. Technical report available at: <http://lap.umd.edu/lap/.of> Service Design Foci, Activities, Phases, Perspectives and Participants.
- Papazoglou, M. & van den Heuvel, W.J. (2007). Service oriented architectures. *The VLDB Journal* Volume16, Issue 3, Pages 389–415.
- Parasuraman A., Zeithaml V.A., & Berry L.L. (1985). "A Conceptual Model of Service Quality and Its Implications for Future Research", *Journal of Marketing*, Volume 49, Pages 41 - 50.
- Parker, S. & Heapy, J., (2006). *The Journey to the Interface*. Report DEMOS, London.

- Pernice, K. & Nielsen, J. (2001). Beyond Alt Text: Making the Web Easy to Use for Users with Disabilities. Retrieved 21 June 2012: <http://www.NN/g.com, n.d./reports/accessibility>.
- Poels, G. (2010). The Resource-Service-System Model for Service, Pages 117–126.
- Polit, D.F., & Hungler, B.P. (1999). Nursing Research: Principles and Methods. Sixth edition. Philadelphia, Lippincott Williams and Wilkins.
- Porat, T., & Tractinsky, N. (2012). It's a Pleasure Buying Here: The Effects of Web-Store Design on Consumers' Emotions and Attitudes. *Human-Computer Interaction*, Volume 27, Issue 3, Pages 235-276.
- Preece, J., Rogers, Y. & Sharp, H. (2011). *Interaction Design: Beyond Human-Computer Interaction*. Second Edition. Chichester: John Wiley and Sons Ltd.
- Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S., & Carey, T. (1994). *Human-computer interaction*. Addison-Wesley.
- Quinn, B., & Paquette, P. (1990). Technology in services: creating organisational revolutions. *The McKinsey Quarterly*, 3, Pages 91-98.
- Quinn, J. B. (1992). The intelligent enterprise a new paradigm. *The Executive*, Volume 6 Issue 4, Pages 48-63.
- Quinn, J. M., & Tran, T. Q. (2010). Attractive phones don't have to work better: independent effects of attractiveness, effectiveness, and efficiency on perceived usability. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 353-362). ACM.
- Reason, B., Downs, C., & Lovlie, L. (2009). Service Thinking. Retrieved 07 September 2011: <http://www.livework.co.uk/articles/service-thinking>.
- Rubin, A., & Babbie, E. (2013). *Brooks/Cole Empowerment Series: Research Methods for Social Work*. Cengage Learning.
- Rust, R. T., & Miu, C. (2006). What academic research tells us about service. *Communications of the ACM*, Volume 49 Issue 7, Pages 49-54
- Sampson, S.E. & Froehle, C.M. (2006). "Foundations and Implications of a Proposed Unified Services Theory," *Production and Operations Management*, summer 2006, Pages 329-343.
- Schrepp, M., Held, T., & Laugwitz, B. (2006) The influence of hedonic quality on the attractiveness of user interfaces of business management software. *Interacting with Computers*, Volume 18, Pages 1055-1069

- Segall, M. H., Dasen, P. R., Berry, J. W., & Poortinga, Y. H. (1999). *Human behavior in global perspective* (2nd ed.). Boston, MA: Allyn & Bacon
- Sharp, H., Preece, J. & Rogers, Y. (2007): *Interaction Design – Beyond Human-Computer Interaction*. 2nd edition. John Wiley & Sons.
- Shneiderman, B. & Plaisant, C. (2005) *Designing the User Interface: Strategies for Effective Human-Computer Interaction: Fourth Edition*, Addison-Wesley Publ. Co., Reading, MA
- Shneiderman, B. & Plaisant, C. (2009). *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. 5th ed. Addison Wesley.
- Shneiderman, B. (2000). Universal usability: pushing human-computer interaction research to empower every citizen. *Communications of the ACM* Volume 43 Issue 5, Pages 84–91.
- Sigci, (2009). [Online] Retrieved 21 September 2011: <http://old.sigchi.org/cdg/cdg2.html>
- Simons, H. (1980). *Towards a science of the singular: Essays about case study in educational research and evaluation*. Norwich, UK: University of East Anglia, Centre for Applied Research in Education.
- Smith, A., Dunckley, L., French, T., Minocha, S., & Chang, Y. (2004). A process model for developing usable cross-cultural websites. *Interacting with computers*, Volume 16 Issue 1 Pages 63-91.
- Sonderegger, A. & Sauer, J. (2010). The influence of design aesthetics in usability testing: effects on user performance and perceived usability. *Applied Ergonomics*, 41 Pages 403–410.
- Spohrer, J. & Maglio, P.P. (2008). The Emergence of Service Science: Toward Systematic Service Innovations to Accelerate Co-Creation of Value. *Production and Operations Management*. Volume 17, Issue 3, pages 238–246
- Spohrer, J., Anderson, L.C., Pass, N.J., Ager, T., & Gruhl, D., (2008). *Service Science*. *J. Grid Computing* Volume 6 Pages.313–324
- Spohrer, J., Maglio, P.P., Bailey, J., & Gruhl, D. (2007). Steps toward a Science of Service Systems. *IEEE Computer* 40, Pages 71–77
- Squires, D. & Preece, J. (1999). Predicting Quality in Educational Software: Evaluating for Learning, Usability and the Synergy Between them. *Interacting with Computers*, Volume 11, Issue 5, Pages 467-483.
- Stake, R.E. (1995). *The Art of Case Study Research: Perspective in Practice*. London: Newbury Park, CA: Sage Publications

- Sun, R. & Zhang, P. (2006). Accounting for a variety of reasoning data within a cognitive architecture. *Journal of Experimental and Theoretical Artificial Intelligence*, Volume 18, Issue 2, pages169-191.
- Taylor, A.S. & Swan, L. (2004). List making in the home.Proceedings of the 2004 ACM conference on Computer supported cooperative work. ACM. Pages 542-545
- Thüring, M., & Mahlke, S. (2007). Usability, aesthetics and emotions in human–technology interaction. *International Journal of Psychology*, Volume 42 Issue 4, Pages 253–264.
- Tractinsky, N. (2006). Aesthetics in information technology: Motivation and future research directions, *Human-Computer Interaction in Management Information Systems: Foundations*. Armonk, New York: M.E. Sharpe. Pages 330-347
- Tractinsky, N. (2012): Visual Aesthetics. In: Soegaard, Mads and Dam, RikkeFriis (eds.). "The Encyclopedia of Human-Computer Interaction, 2nd Ed." Aarhus, Denmark: The Interaction Design Foundation. [online] Retrieved 14 January 2013: http://www.interaction-design.org/encyclopedia/visual_aesthetics.html
- Tractinsky, N., Cokhavia, A., Kirschenbauma, M., & Sharfib, T. (2006). Evaluating the consistency of immediate aesthetic perceptions of web pages. *International Journal of Human-Computer Studies*, Volume 64 Issue 11 Pages 1071-1083.
- Trischler, W.E. (1996). *Understanding and Applying Value Added Assessment*. Milwaukee, WI: ASQ Quality Press.
- Umd (2012). QUIS. Questionnaire for user interface satisfaction. Retrieved 21 June 2012: <http://www.lap.umd.edu/quis/>.
- Usability.gov, (2012). Usability Basics | Usability.gov. [online] Retrieved 27 December 2012: <http://www.usability.gov/basics/index.html>.
- Van der Heijden, H. (2003). Factors influencing the usage of websites: the case of a generic portal in The Netherlands. *Information & Management*, Volume 40, Issue 6, July 2003, Pages 541–549
- Van Dijk, G., Minocha, S., & Laing, A., (2007). Consumers, channels and communication: online and offline communication in service consumption. *Interacting with Computers* Volume 19 Issue 1 Pages 7–19.
- Van Schaik,P., & Ling, J. (2009). The role of context in perceptions of the aesthetics of web pages over time. *International Journal of Human-Computer Studies* Volume 67 Issue1, pages 79-89

- Vanderheiden, G. C. (1994). Application Software Design Guidelines: Increasing the Accessibility of Application Software to People with Disabilities and Older Users. Retrieved 24 June 2011: http://trace.wisc.edu/docs/software_guidelines/software.htm.
- Vargo, S.L. & Lusch, R.F. (2004). Evolving to a new dominant logic for marketing. *Journal of Marketing* Volume 68 Issue 1 Pages 1–17.
- Vicari S, Verucci L, & Carlesimo GA (2007) Implicit memory is independent from IQ and age but not from etiology: evidence from Down and Williams syndromes. *Journal of Intellectual Disability Research* Volume 51, Issue 12, pages 932–941
- Weigand, H., Johannesson, P., Andersson, B., & Bergholtz, M., (2009). Value-Based Service Modeling and Design: Toward a Unified View of Services. In: van Eck, P., Gordijn, J., Wieringa, R. (eds.) CAiSE 2009. LNCS, Springer, Heidelberg. Volume 5565, Pages 410–424.
- Whiteside, J., Bennett, J., & Holtzblatt, K. (1988). Usability engineering: Our experience and evolution. In Helander, M. (Ed.), *Handbook of human-computer interaction*, Amsterdam, The Netherlands: North-Holland. Pages 791-817.
- Wild, P.J. (2010). Longing for service: Bringing the UCL Conception towards services research, institute of manufacturing, University of Cambridge
- Wild, P.J., Clarkson, P.J., & McFarlane, D. (2009a). A framework for cross disciplinary efforts in services research. In: Roy, R., Shehab, E. (Eds.), *Industrial Product Service Systems*, Cranfield 1–2nd April 2009. University Press, Cranfield, Pages 145–152.
- Wild, P.J., Pezzotta, G., Cavalieri, S., & McFarlane, D.C. (2009b). Towards a Classification of Service Design Foci, Activities, Phases, Perspectives and Participants. MITIP'09 Bergamo.
- Yin, R. (1984). *Case study research: Design and methods* (1st Ed.). Beverly Hills, CA: Sage Publishing.
- Yin, R. (1989). *Case study research: Design and methods* (Rev. Ed.). Newbury Park, CA: Sage Publishing.
- Yin, R. (1993) .*Applications of case study research*. Newbury Park, CA: Sage Publishing.
- Yin, R. (1994). *Case study research: Design and methods* (2nd Ed.). Thousand Oaks, CA: Sage Publishing.
- Young, J.A. (1988). Technology and competitiveness: A key to the economic future of the United States. *Science*, Volume 241 Pages 313-316.

Zeithaml V.A.(1981). “How Consumer Evaluation Processes Differ between Goods and Services”, reprinted in Lovelock, C. (1991), Services Marketing, 2nd Edition, Upper Saddle River, New Jersey: Prentice Hall.

Appendix A: QUIZ

System code:

THE ACCTRAV SYSTEM COMPUTER-BASED SYSTEM

PART 2: Past Experience

Gender:

male

female

PART 1: System Experience

1.1 How long have you worked on this system?

less than 1 hour

1 hour to less than 1 day

1 day to less than 1 week

1 week to less than 1 month

1 month to less than 6 months

6 months to less than 1 year

1 year to less than 2 years

2 years to less than 3 years

3 years or more

1.2 On the average, how much time do you spend per week on this system?

less than one hour

one to less than 4 hours

4 to less than 10 hours

over 10 hours

2.1 How many operating systems have you worked with?

none

1

2

3-4

5-6

more than 6

2.2 Of the following devices, software, and systems, check those that you have personally used and are familiar with:

Computer terminal

colour monitor

CD-ROM drive

TrackBall

Graphics Tablet

Scanners

SpreadSheet software

Voice Recognition

Rapid prototyping system

Personal Computer

Touch Screen

Keyboard

Pen Based Computing

Head mounted display

Word Processor

Database software

Video Editing software

email

Laptop computer

Floppy drive

Mouse

Modems

Graphics software

Computer games

CAD computer aided design

Internet

PART 3: Overall User Reactions

Please circle the numbers which most appropriately reflect your impressions about using this computer system.

Not Applicable = NA.

3.1 Overall reactions to the system: terrible _____ wonderful _____
1 2 3 4 5 6 7 8 9 NA

3.2 frustrating _____ satisfying _____
1 2 3 4 5 6 7 8 9 NA

3.3 dull _____ stimulating _____
1 2 3 4 5 6 7 8 9 NA

3.4 difficult _____ easy _____
1 2 3 4 5 6 7 8 9 NA

3.5 inadequate power _____ adequate power _____
1 2 3 4 5 6 7 8 9 NA

3.6 rigid _____ flexible _____
1 2 3 4 5 6 7 8 9 NA

Please write any comments about you reactions to the system here:

PART 4: Screen

Please circle the numbers which most appropriately reflect your impressions about using this computer system.

Not Applicable = NA

4.1 Characters on the computer screen hard to read easy to read
 1 2 3 4 5 6 7 8 9 NA

4.1.1 Image of characters fuzzy sharp
 1 2 3 4 5 6 7 8 9 NA

4.1.2 Character shapes (fonts) barely legible very legible
 1 2 3 4 5 6 7 8 9 NA

4.2 Highlighting on the screen unhelpful helpful
 1 2 3 4 5 6 7 8 9 NA

4.2.1 Use of reverse video unhelpful helpful

1 2 3 4 5 6 7 8 9 NA

4.2.2 Use of blinking unhelpful helpful
 1 2 3 4 5 6 7 8 9 NA

4.2.3 Use of bolding unhelpful helpful
 1 2 3 4 5 6 7 8 9 NA

4.3 Screen layouts were helpful never always
 1 2 3 4 5 6 7 8 9 NA

4.3.1 Amount of information that can be displayed on screen inadequate adequate
 1 2 3 4 5 6 7 8 9 NA

4.3.2 Arrangement of information on screen illogical logical
 1 2 3 4 5 6 7 8 9 NA

4.4 Sequence of screens confusing clear

		1 2 3 4 5 6 7 8 9	NA
4.4.1	Next screen in a sequence	unpredictable	predictable
		1 2 3 4 5 6 7 8 9	NA
4.4.2	Going back to the previous screen	impossible	easy
		1 2 3 4 5 6 7 8 9	NA
4.4.3	Progression of work related tasks	confusing	clearly marked
		1 2 3 4 5 6 7 8 9	NA

Please write your comments about the screens here:

PART 5: Terminology and System Information

Please circle the numbers which most appropriately reflect your impressions about using this computer system.

Not Applicable = NA

5.1	Use of terminology throughout system	inconsistent	consistent
		1 2 3 4 5 6 7 8 9	NA
5.1.2	Work related terminology	inconsistent	consistent
		1 2 3 4 5 6 7 8 9	NA
5.1.3	Computer terminology	inconsistent	consistent
		1 2 3 4 5 6 7 8 9	NA
5.2	Terminology relates well to the work you are doing?	never	always
		1 2 3 4 5 6 7 8 9	NA
5.2.1	Computer terminology is used	too frequently	appropriately

		1 2 3 4 5 6 7 8 9		NA		1 2 3 4 5 6 7 8 9		NA
					5.5	Computer keeps you informed about		
5.2.2	Terminology on the screen	ambiguous		precise		what it is doing	never	always
		1 2 3 4 5 6 7 8 9						
5.3	Messages which appear on screen	inconsistent		consistent			1 2 3 4 5 6 7 8 9	NA
		1 2 3 4 5 6 7 8 9						
					5.5.1	Animated cursors keep you		
							never	always
5.3.1	Position of instructions on the screen	inconsistent		Consistent		informed		
		1 2 3 4 5 6 7 8 9					1 2 3 4 5 6 7 8 9	NA
5.4	Messages which appear on screen	confusing		clear				
		1 2 3 4 5 6 7 8 9						
					5.5.2	Performing an operation leads to a		
							never	always
5.4.1	Instructions for commands or functions	confusing		clear			1 2 3 4 5 6 7 8 9	NA
		1 2 3 4 5 6 7 8 9						
					5.5.3	Controlling amount of feedback	impossible	easy
5.4.2	Instructions for correcting errors	confusing		clear			1 2 3 4 5 6 7 8 9	NA

5.5.4 Length of delay between operation unacceptable acceptable
 1 2 3 4 5 6 7 8 9 NA

5.6 Error messages unhelpful helpful
 1 2 3 4 5 6 7 8 9 NA

5.6.1 Error messages clarify the problem never always
 1 2 3 4 5 6 7 8 9 NA

5.6.2 Phrasing of error messages unpleasant pleasant
 1 2 3 4 5 6 7 8 9 NA

PART 6: Learning

Please circle the numbers which most appropriately reflect your impressions about using this computer system.

Not Applicable = NA

6.1 Learning to operate the system difficult easy
 1 2 3 4 5 6 7 8 9 NA

6.1.1 Getting started difficult easy
 1 2 3 4 5 6 7 8 9 NA

6.1.2 Learning advanced features difficult easy

Please write your comments about terminology and system information here:

		1 2 3 4 5 6 7 8 9	NA	6.3.1	Remembering specific rules about entering commands	difficult	easy	
6.1.3	Time to learn to use the system	slow	fast			1 2 3 4 5 6 7 8 9		NA
		1 2 3 4 5 6 7 8 9	NA	6.4	Tasks can be performed in a straightforward manner	never	always	
6.2	Exploration of features by trial and error	discouraging	encouraging			1 2 3 4 5 6 7 8 9		NA
		1 2 3 4 5 6 7 8 9	NA					
6.2.1	Exploration of features	risky	safe	6.4.1	Number of steps per task	too many	just right	
		1 2 3 4 5 6 7 8 9	NA			1 2 3 4 5 6 7 8 9		NA
6.2.2	Discovering new features	difficult	easy	6.4.2	Steps to complete a task follow a logical sequence	never	always	
		1 2 3 4 5 6 7 8 9	NA			1 2 3 4 5 6 7 8 9		NA
6.3	Remembering names and use of commands	difficult	easy					
		1 2 3 4 5 6 7 8 9	NA	6.4.3	Feedback on the completion of sequence of steps	unclear	clear	

1 2 3 4 5 6 7 8 9

NA

1 2 3 4 5 6 7 8 9

NA

7.1.1 Response time for most operations

too slow

fast enough

1 2 3 4 5 6 7 8 9

NA

Please write your comments about learning here:

7.1.2 Rate information is displayed

too slow

fast enough

1 2 3 4 5 6 7 8 9

NA

7.2 The system is reliable

never

always

1 2 3 4 5 6 7 8 9

NA

PART 7: System Capabilities

Please circle the numbers which most appropriately reflect your impressions about using this computer system.

Not Applicable = NA

7.2.1 Operations are

undependable

dependable

1 2 3 4 5 6 7 8 9

NA

7.2.2 System failures occur

frequently

seldom

1 2 3 4 5 6 7 8 9

NA

7.1 System speed

too slow

fast enough

7.2.3 System warns you about

never

always

	potential problems	1 2 3 4 5 6 7 8 9	NA		1 2 3 4 5 6 7 8 9	NA
7.3	System tends to be	noisy	quiet	7.5	Ease of operation depends on your level of experience	never always
		1 2 3 4 5 6 7 8 9	NA		1 2 3 4 5 6 7 8 9	NA
7.3.1	Mechanical devices such as fans, disks, and printers	noisy	quiet	7.5.1	You can accomplish tasks knowing only a few commands	with difficulty easily
		1 2 3 4 5 6 7 8 9	NA		1 2 3 4 5 6 7 8 9	NA
7.3.2	Computer generated sounds are	annoying	pleasant	7.5.2	You can use features/shortcuts	with difficulty easily
		1 2 3 4 5 6 7 8 9	NA		1 2 3 4 5 6 7 8 9	NA
7.4	Correcting your mistakes	difficult	easy			1 2 3 4 5 6 7 8 9 NA
		1 2 3 4 5 6 7 8 9	NA			
7.4.1	Correcting typos	complex	simple			
		1 2 3 4 5 6 7 8 9	NA			
7.4.2	Ability to undo operations	inadequate	adequate			

Please write your comments about system capabilities here:

	problem using the manual	impossible	easy	
		1 2 3 4 5 6 7 8 9		NA
8.3	Amount of help given	inadequate	adequate	
		1 2 3 4 5 6 7 8 9		NA

PART 8: Technical Manuals and On-line help

Please circle the numbers which most appropriately reflect your impressions about using this computer system.

Not Applicable = NA

8.1	Technical manuals are	confusing	clear	
		1 2 3 4 5 6 7 8 9		NA

8.1.1	The terminology used in the manual	confusing	clear	
		1 2 3 4 5 6 7 8 9		NA

8.2	Information from the manual is easily understood	never	always	
		1 2 3 4 5 6 7 8 9		NA

8.2.1 Finding a solution to a

8.3.1	Placement of help messages on the screen	confusing	clear	
		1 2 3 4 5 6 7 8 9		NA
8.3.2	Accessing help messages	difficult	easy	
		1 2 3 4 5 6 7 8 9		NA
8.3.3	Content of on-line help messages	confusing	clear	
		1 2 3 4 5 6 7 8 9		NA

8.3.4 Amount of help given inadequate adequate
1 2 3 4 5 6 7 8 9 NA

Please write your comments about technical manuals and on-line help here:

8.3.5 Help defines specific aspects of the system inadequately adequately
1 2 3 4 5 6 7 8 9 NA

8.3.6 Finding specific information using the on-line help difficult easy
1 2 3 4 5 6 7 8 9 NA

PART 9: On-line Tutorials

Please circle the numbers which most appropriately reflect your impressions about using this computer system.

8.3.7 On-line help useless helpful
1 2 3 4 5 6 7 8 9 NA

Not Applicable = NA

9.1 Tutorial was useless helpful
1 2 3 4 5 6 7 8 9 NA

9.1.1 Accessing on-line tutorial difficult easy

		1 2 3 4 5 6 7 8 9	NA				
9.2	Maneuvering through the tutorial was	difficult	easy		9.3.2	Information was concise and to the point	never always
		1 2 3 4 5 6 7 8 9	NA				1 2 3 4 5 6 7 8 9 NA
				9.4	Tasks can be completed	with difficulty	easily
9.2.1	Tutorial is meaningfully structured	never	always				1 2 3 4 5 6 7 8 9 NA
		1 2 3 4 5 6 7 8 9	NA				
9.2.2	The speed of presentation was	unacceptable	acceptable		9.4.1	Instructions given for completing tasks	confusing clear
		1 2 3 4 5 6 7 8 9	NA				1 2 3 4 5 6 7 8 9 NA
9.3	Tutorial content was	useless	helpful		9.4.2	Time given to perform tasks	inadequate adequate
		1 2 3 4 5 6 7 8 9	NA				1 2 3 4 5 6 7 8 9 NA
9.3.1	Information for specific aspects of the system were complete and informative	never	always	9.5	Learning to operate the system using the tutorial was	difficult	easy
		1 2 3 4 5 6 7 8 9	NA				1 2 3 4 5 6 7 8 9 NA

9.5.1 Completing system tasks

after using

difficult

easy

only the tutorial

1 2 3 4 5 6 7 8 9

NA

Please write your comments about on-line tutorials here:

Appendix B: RESEARCH LETTERS

Part I: Permission letter

1721 Tali's Place
156 Market Street
Johannesburg 2001
Tel: 071 000 4919
Nov 25, 2011
Email:
brian@nabusiu.com

To:
Managing Director,
BCD Travel
1st Floor, Old Trafford No.4;
Corner of CarseO'Gowrie and Boundary Roads
Isle of Houghton; Houghton;
South Africa
Phone: 011 274 4000

Dear Sir,

**Ref: SEEKING PERMISSION TO ACCESS SOME COMPANY RESOURCES
TO CONDUCT AN ACADEMIC RESEARCH STUDY**

I hereby seek permission to be granted access to some of the company resources, in particular, front-end and back-end staff, sales and operations staff, a computer-based (information) system used by these staff and

some documents(system manuals or system specifications). Of interest is the acctrav system or its replacement thereof.

The intention of seeking permission is be able to conduct a research study. This research study is entirely meant for academic purposes. Specifically, this will help meet the requirements of writing a dissertation to be submitted for examination leading to award of a Master of Science degree in Information Systems.

The research study will be conducted within a period of five (5) months, starting March 2012 to July 2012. The objective of this research study, among others, is to investigate the application of a selection of Human Computer Interaction (HCI) approaches to a computer-based system to

1. ascertain the usability problems encountered by users while interacting with the system when accomplishing daily tasks,
2. determine how these usability problems may impact on the business and,
3. establish any business benefit derived as a result of applying selected HCI approaches in the correction of the usability problems.

The business benefits anticipated will be in areas such as

- a) redefinition of business processes to generate competitive advantage;
- b) improved user productivity while interacting with information systems;
- c) cost reductions, especially end-user training through facilitating ease of learning, resulting in skills enhancement and or retention;
- d) improved business operations. Quality service provision will be of particular interest.

System usability evaluation and user experience evaluation studies shall be conducted on the selected computer-based (information) system. To

achieve the above objectives data will be collected on business requirements, flow of tasks or processes, the system in question to identify inefficiencies that may affect productivity and, organizational and physical environments. This will involve observation and interviewing of the participants as they work, taking notes on particular activities and often ask questions about executed tasks. This may also involve participants filling in some questionnaires.

In order to produce justifiable, meaningful and satisfactory results, the research study shall be conducted in five (5) sessions, involving a minimum of fifteen (15) and a maximum of twenty (20) participants. Contact time spent with each participant shall be limited to 45 minutes for every session. This will help avoid any negative impact on the participants' required official duties. Consent from the participants shall be sought upfront, preferably by signing a consent form, before getting involved in the research study. Those involved will be free to withdraw from the study anytime with or without prior notification. Research ethics shall be highly adhered to. Confidentiality and protection of data and the participants' identity will be very crucial.

NB: I have attached a university letter confirming the acceptance of the research proposal.

Sincerely Yours

Brian James Nabusi

MSc, Information Systems, School of Computing, University of South Africa, Pretoria.

cc. Indiran Nair, acting BIS Manager
cc. BonganiSukazi, Financial Director
cc. AlnaSchute, National Operations Manager
cc. Julianne Barker, Strategic Client Manager
cc. KhulaZungu, HR specialist
cc. Prof. Helene Gelderblom, University of South Africa (Chief Supervisor)
cc. Mr. Tobie J. van Dyk, University of South Africa (co-Supervisor)

Part II:

CONFIDENTIALITY AGREEMENT

This study, BENEFITS THAT A BUSINESS CAN DERIVE FROM HCI INTERVENTIONS, is being undertaken by Brian Nabusiu at the University of South Africa.

The study objectives: is to investigate the application of a selection of Human Computer Interaction (HCI) approaches to a computer-based system to

1. ascertain the usability problems encountered by users while interacting with the system when accomplishing daily tasks,
2. determine how these usability problems may impact on the business,
3. establish any business benefit derived as a result of applying selected HCI approaches in the correction of the usability problems.

Data from this study will be used in the dissertation for an MSc degree.

I, **Brian Nabusiu**, agree to:

1. Participant will be free to withdraw from the study anytime with or without prior notification.
2. I will not disclose data or information to anyone other than those to whom I am authorised to do so (supervisors).
3. Keep all the information shared with me confidential by not discussing or sharing the research information in any form or format (e.g. disks, tapes, transcripts) with anyone other than the supervisors;

4. Keep all research information in any form or format secure while it is in my possession;
5. I will maintain the privacy and confidentiality of all accessible data and understand that unauthorised disclosure of personal/confidential data is an invasion of privacy and may result in disciplinary, civil, and or criminal actions against me.
6. I will use data only for the purposes for which I am authorised explicitly. In this case for dissertation. On no occasion will I use data, including personal or confidential information, for my personal interest or advantage, or for any other business purposes.
7. I will comply at all times with the practice's data security policies and confidentiality code of conduct.
8. I am informed that the references to personal, confidential and sensitive information in these documents are for my information, and are not intended to replace my obligations under the Data Protection Act 1998.
9. I understand that where I have been given access to confidential information I am under a duty of confidence and would be liable under common law for any inappropriate breach of confidence in terms of disclosure to third parties and also for invasion of privacy if I were to access more information than that for which I have been given approval or for which consent is in place.
10. Should my employment be terminated or my work in relation to the study discontinues for any reason, I understand that I will continue to be bound by this signed Confidentiality Agreement.

Student Researcher:

Brian Nabusi

Participant:

(print name) (signature) (date)

If you have any questions or concerns about this study, please contact:

Professor J.H Gelderblom or Mr. T.J van Dyk

School of Computing, CSET, University of South Africa

Preller St, Muckleneuk, Pretoria 0003

(012) 429- or (012) 429-6676

For questions regarding participants rights and ethical conduct of research, contact
the University of South Africa Research Office at (705)748-1011 ext. 7050

Appendix C: TMC SYSTEMS, PROCESSES AND SAMPLE REPORTS

GLOBAL DISTRIBUTION SYSTEM

All reservations made by Connex Travel on behalf of clients are made on Galileo (Global Distribution System) being a central reservation system utilised by Connex Travel.

- Customer requirements are loaded into the Galileo system in the BARS and PARS (Passenger Profile System) as well the corporate rates and deals
- If there are no available flights in the policy, the quotes will be sent with the lowest available fare offer.
- The customer travel policies are set up in AccTrav.

RECEIPT OF THE REQUEST FOR QUOTATION

The trip request is emailed or rightfaxed to the consultant responsible for the account. The consultant accesses Galileo for the relevant information in Galileo Focalpoint. The quote is created in Document Producer (refer to detailed information on Document Producer as per **Diagram C** on Value Added Services) offering the client 3 options or more if required. The quote is emailed or rightfaxed to the client.

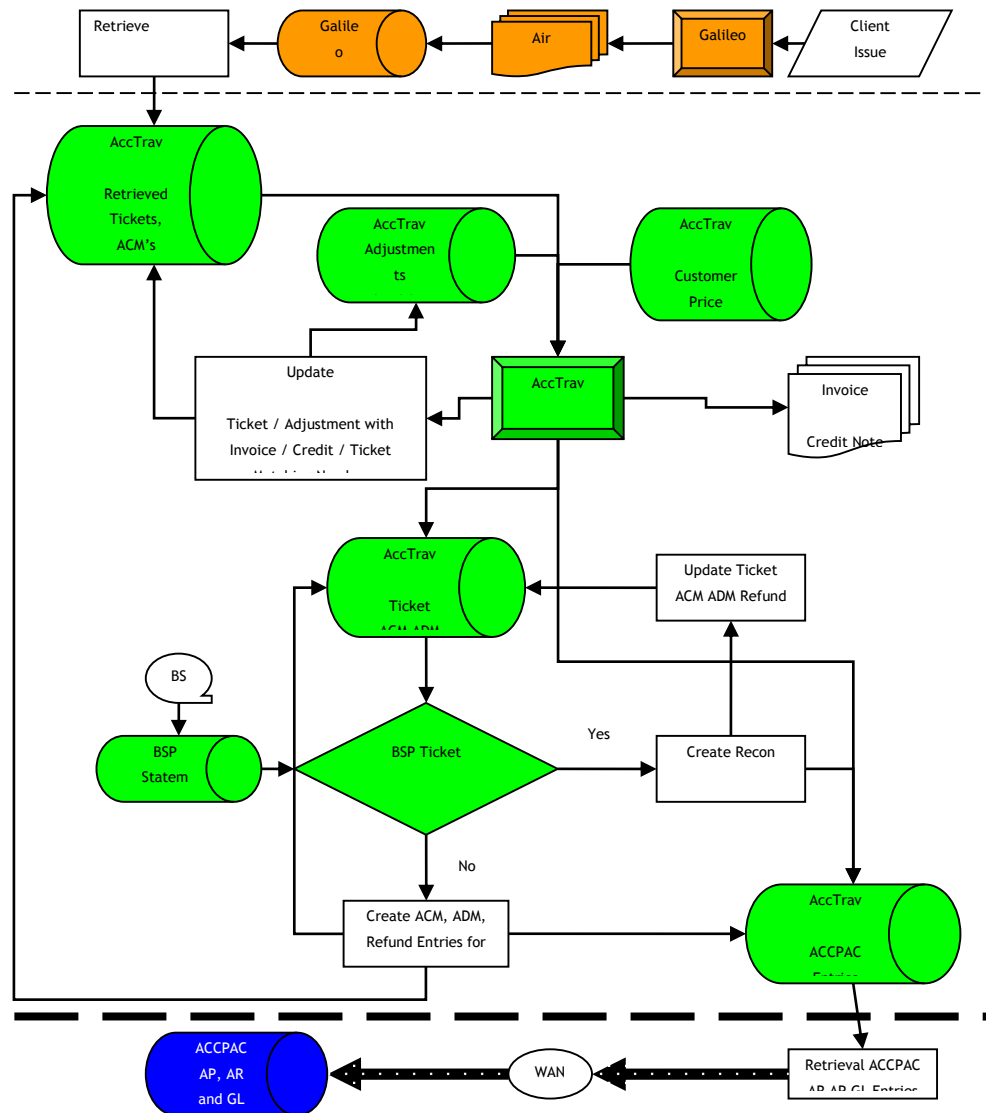
ORDER CONFIRMATION PROCESS

The client accepts the quote and rightfaxes or emails the quote with a valid purchase order to the consultant. The consultant confirms the booking as per the request in Galileo. The confirmed booking automatically populates in Document Producer enabling the consultant to email or rightfax the confirmation. The confirmation is also available via sms (Galileo SMS application). Refer to detailed information on Galileo SMS as per the **Diagram C** on Value Added Services. The PNR (Passenger Name Record) consisting of a Galileo Script which contains customer details then generates in Galileo and automatically pulls through into AccTrav (Voucher creation System developed inhouse).

DETAILED AIR TICKET RESERVATION PROCESS

- Air tickets pull through into AccTrav BackOffice BSP (Bank Settlement Plan) Module
- Ticket details are verified and saved. The invoice is generated on saving i.e. once the user clicks on the save button, the invoice is generated.

Ticket Reservation Process at Connex Travel (Diagram A)



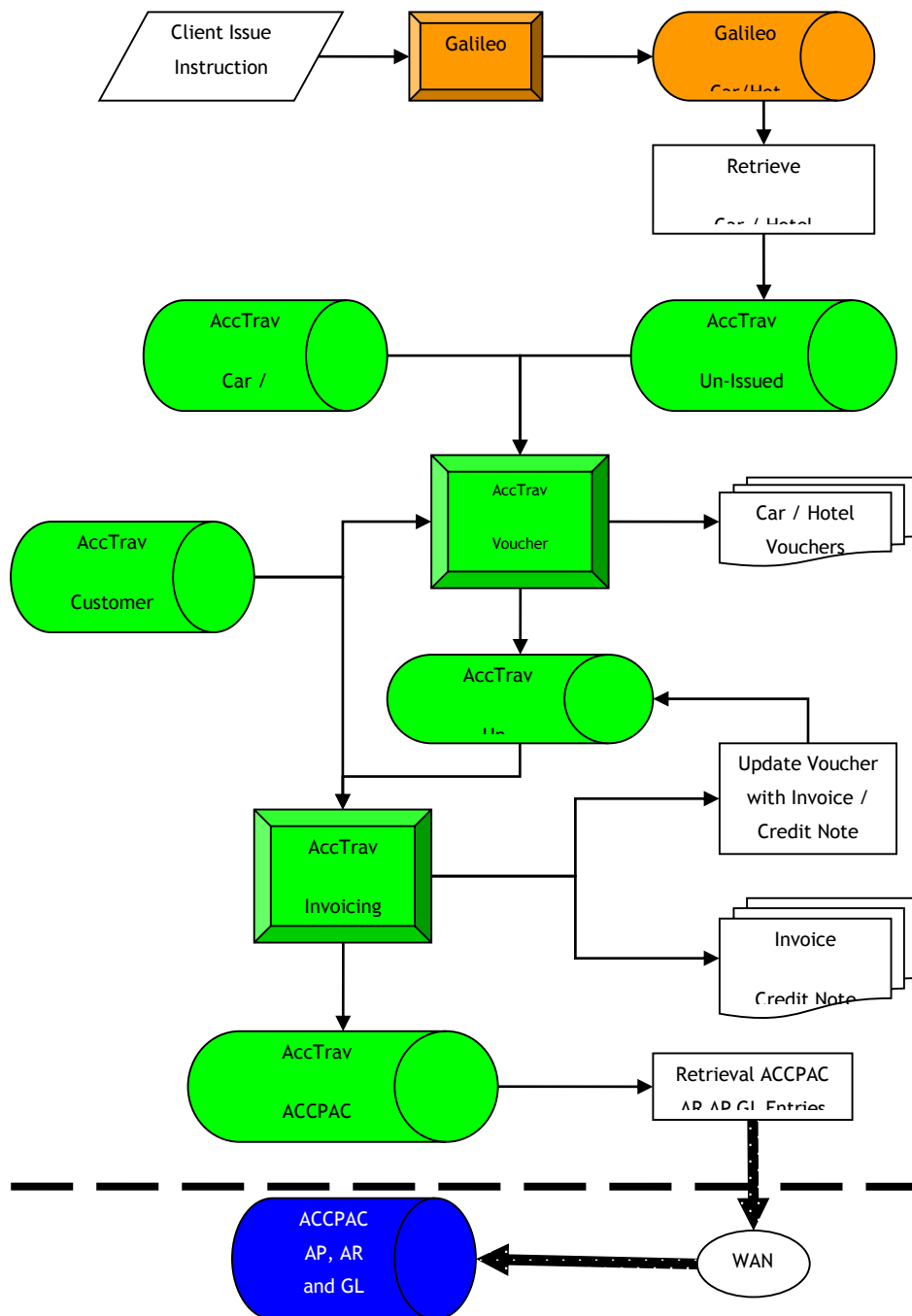
DETAILED LAND ARRANGEMENT RESERVATION PROCESS

Vouchers (Car, Accommodation, Shuttle etc)

- Vouchers pull through into AccTrav FrontOffice (voucher creation)
- Vouchers are completed and emailed or rightfaxed to the client.
- Once the voucher has been created, it pulls through to AccTrav BackOffice for invoicing. If the FOP (form of payment) is bill back, the un-invoiced voucher will remain as un-invoiced until the invoice is received from the supplier. Once received,

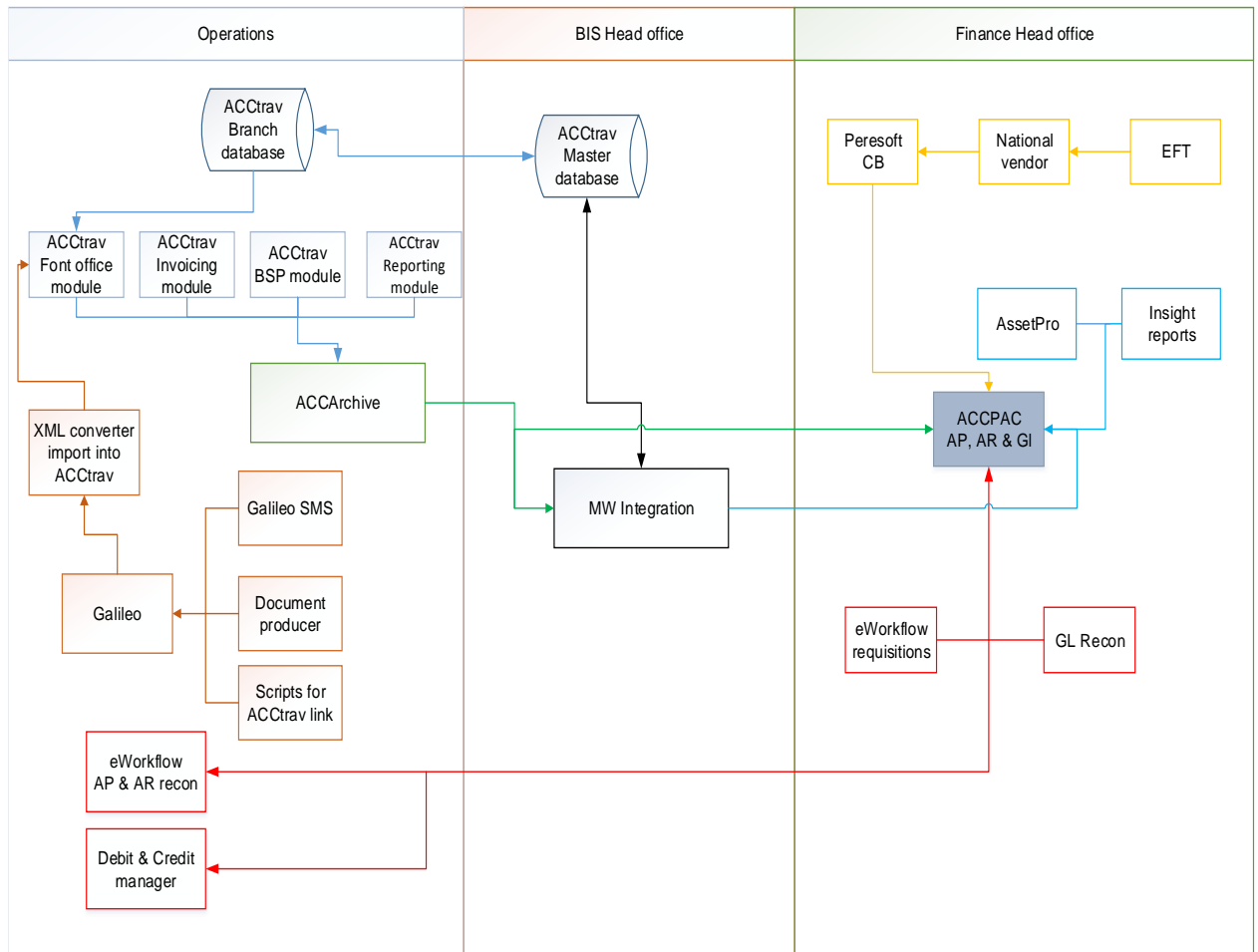
the invoice is matched to the voucher; the details are verified prior to invoicing. If the FOP is Referral/Settle direct, the voucher is automatically invoiced two days after departure date of travel showing the estimated charges of the accommodation expenses.

Land arrangement reservation process flow at Connex Travel (Diagram B)



Monthly Statements and invoices are submitted to clients as per customer requirements (weekly or monthly).

Overview of the system at Connex Travel (Diagram C)



Sample reports

E-Ticket report

A	B	C	D	E	F	G	H	I	J
Ticket number	Coupon status	Travel date	Origin airport	Destination airport	Airline	Locator	Passenger name	PCC	Issued date
833300551645	UNUSED	210209	FRA	CPH	LH	JRXH4B	PIERREMRVOGES	5UP9	80109
833300551646	UNUSED	20309	FRA	JNB	SA	JRXH4B	PIERREMRVOGES	5UP9	80109
833300551646	UNUSED	20309	GOT	FRA	LH	JRXH4B	PIERREMRVOGES	5UP9	80109
833300551646	UNUSED	30309	JNB	PLZ	SA	JRXH4B	PIERREMRVOGES	5UP9	80109
833300551645	UNUSED	200209	PLZ	JNB	SA	JRXH4B	PIERREMRVOGES	5UP9	80109
833300551645	UNUSED	200209	JNB	FRA	SA	JRXH4B	PIERREMRVOGES	5UP9	80109
833300680567	UNUSED	200209	PLZ	JNB	SA	SDDCS4	GERRITJOHANMRVENTER	5UP9	160109

Exception Report

Cost Centre	(All)	
Values		
Exception	Sum of Sales Amt	Sum of No of Trans
ESK-AUTHORIZATION BY ESKOM TRAVEL MANAGER TO ISSUE	596,790.00	7
ESK-FARE SAVING	2,342,824.00	683
ESK-HIGHER CLASS BOOKED LOWER CLASS FULL	4,360.00	3
ESK-IN/OUT OF TP/NON CONFORMANCE TO CORP AGREEMEN	37,950.00	12
Grand Total	2,981,924.00	705

Accommodation Usage

Product	Vendor Group	Sum of Sales Total	Sum of No of Trans
24 HOUR	AERO24...	19,549.00	26
24 HOUR Total		19,549.00	26
ACCOMMODATION	CITY LODGE HOTELS	273,531.62	173
	CONFERENCE CENTRES	4,184.00	2
	FOREVER RESORTS AVENTURA	580.00	1
	GUEST HOUSES/LODGES/FARMS & B&B	363,048.94	183
	HOTELS OTHER	337,697.62	185
	KAT LEISURE HOTELS	5,912.40	1
	LEGACY HOTELS & RESORTS INTERNATIONAL	8,723.20	4
	PREMIER HOTELS & RESORTS INTERNATIONAL	925.00	1
	PROTEA HOTELS	161,108.76	90
	SOUTHERN SUN	398,083.33	200
	THREE CITIES GROUP	18,344.00	8
	TUSK RESORTS	3,292.85	3
ACCOMMODATION Total		1,575,431.72	851

Car Rental

Product	National vendor	Sum of Sales Total	Sum of No of Trans
CAR RENTAL	AVIS RENT A CAR	120,056.83	46
	EUROPCAR	406,738.18	982
	IMPERIAL CHAUFFEUR DRIVE	31.40	17
CAR RENTAL Total		526,826.41	1045
CHAUFFEUR DRIVE	GATEWAY SHUTTLE SERVICE	1,440.00	6
	GREYHOUND COACH LINES	740.00	2
	MOVE AROUND SHUTTLES	1,560.00	5
	NEILS TRANSFER SERVICES	7,020.00	24
	SECHABA AFRICA EXECUTIVE TRANSFERS	1,700.00	3
CHAUFFEUR DRIVE Total		12,460.00	40
Grand Total		539,286.41	1085

Exception Report

Cost Centre	(All)	
Values		
Exception	Sum of Sales Amt	Sum of No of Trans
ESK-AUTHORIZATION BY ESKOM TRAVEL MANAGER TO ISSUE	596,790.00	7
ESK-FARE SAVING	2,342,824.00	683
ESK-HIGHER CLASS BOOKED LOWER CLASS FULL	4,360.00	3
ESK-IN/OUT OF TP/NON CONFORMANCE TO CORP AGREEMEN	37,950.00	12
Grand Total	2,981,924.00	705

Airline Report

		Values	
Product	Vendor Group	Sum of Sales Total	Sum of No of Trans
<input type="checkbox"/> DOMESTIC AIR	BRITISH AIRWAYS	532,582.00	166
	LAM - LINHAS AEREAS DE MOCAMBIQUE	-251.00	-1
	SOUTH AFRICAN AIRWAYS	6,429,262.09	2091
DOMESTIC AIR Total		6,961,593.09	2256
<input type="checkbox"/> INTERNATIONAL AIR	AIR FRANCE	338,330.00	6
	AIR SENEGAL INTERNATIONAL	0.00	0
	AMERICAN AIRLINES	24,761.00	4
	BRITISH AIRWAYS	260,976.00	2
	CATHAY PACIFIC	19,218.00	0
	CONTINENTAL AIRLINES	-44,260.00	0
	EGYPT AIR	19,179.00	3
	EMIRATES AIRLINES	-75,566.00	1
	KENYA AIRWAYS	84,922.00	1
	KLM ROYAL DUTCH AIRLINES	-60,663.00	-1
	LAM - LINHAS AEREAS DE MOCAMBIQUE	4,102.00	1
	LUFTHANSA GERMAN AIRLINES	358,574.00	8
	QATAR AIRWAYS	59,670.00	1
	SILKAIR SINGAPORE PTY LTD	11,328.00	0
	SOUTH AFRICAN AIRWAYS	1,361,905.00	61
	SWISS INTERNATIONAL AIRLINES	-2,627.00	0
	TUNIS AIR	34,469.00	1
	UNITED AIRLINES	3,442.00	0
	VIRGIN ATLANTIC AIRWAYS	15,603.00	1
INTERNATIONAL AIR Total		2,413,363.00	89
Grand Total		9,374,956.09	2345

Non Contract usage report

Project/Business unit	(All)
Row Labels	Sum of Variance in Days
In policy	5566
Out of policy	1365
Grand Total	6931

Travel Changes

<u>PNR</u>	<u>InvoiceNo</u>	<u>Tkt No</u>	<u>No.Changes</u>	<u>DocDate</u>	<u>BranchName</u>	<u>CustName</u>
LZSJHW	207-0000029246	5787095110	11	04-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
LZSJHW	207-0000029247	5787095111	11	04-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
LZSJHW	207-0000029248	5787095112	11	04-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
QHMJ5A	207-0000030161	3142870438	14	15-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
R6CFZK	207-0000030172	3142870449	9	15-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
ZJGK70	207-0000029685	5787095237	13	03-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
ZMB8HG	207-0000029718	3142870278	19	04-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
ZRXSD8	207-0000029719	3142870279	12	04-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
N8ML7S	207-0000029693	5787095244	1	04-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
N6401O	207-0000029694	5787095245	1	04-Jul-2008	JOHANNESBURG	CIBC OTHER CIB
Q7TS1U	207-0000030098	3142870385	21	11-Jul-2008	JOHANNESBURG	CIBC OTHER CIB

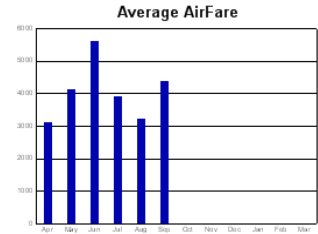
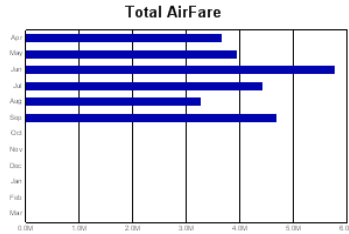
Top 50 Travellers

Cost Centre		(All)	Values		
Pax		Sum of Sales Amt	Sum of Sales Total	Sum of No of Trans	
JOSEPHMR JOHNSON		183,350.00	192,954.00	3	
RAQUEL BRIGHAMBROWN		176,500.00	185,510.00	2	
DR STEPHEN JOHN LENNON		129,370.00	136,906.00	2	
PHIRWA JACOB MAROGA		113,510.00	120,548.00	2	
PHIRWA JACOB MAROGA		109,830.00	114,989.00	1	
LARSMR JOSEFSSON		81,110.00	84,922.00	1	
AVIN HARILAL NAHARAJ		74,820.00	78,345.00	1	
CHRISTO SPAMMER		70,920.00	74,445.00	1	
PENELOPEJANEMRS HERBST		65,740.00	75,273.00	2	
A P SWANEPOEL		64,754.40	64,754.40	2	
BREVIN CLAASSEN		64,535.15	64,535.15	1	
NOEL MICHAELS		64,535.15	64,535.15	1	
L D DEVILLIERS		64,535.15	64,535.15	1	
ROBERTMR HOVEY		63,600.00	67,367.00	1	
ALEXANDERM STRAMROOD		60,130.00	64,260.00	2	
VICTOR ALLEN LAWRENCE		57,610.00	60,663.00	1	
BARRYMR MACCOLL		52,120.00	56,747.00	2	
GREGORYROBERTMR TOSEN		49,020.00	52,526.00	1	
WENDYMS POULTON		46,680.00	50,193.00	1	
R THANJEKWAYO		45,000.00	45,000.00	1	
ANTONIEPHILIPPUS SWANEPOEL		40,240.00	43,081.00	1	
LESLIEALAN CARLO		40,240.00	43,081.00	1	
JUDY RAPHEAL		40,240.00	43,081.00	1	
WILLEMJACOBUSJMR DUPLESSIS		40,240.00	43,081.00	1	
LINDAMR YANTA		40,240.00	43,081.00	1	
MABAETIMS MOLELEKOA		39,730.00	43,833.00	1	
MARIUS HOMEWOOD		37,510.00	40,454.00	1	
SINCEDILE SHWENI		37,510.00	40,454.00	1	
TSHIFHIWABERNARDMR MAGORO		34,980.00	37,989.00	1	

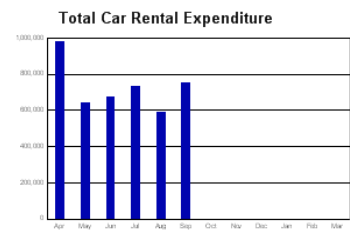
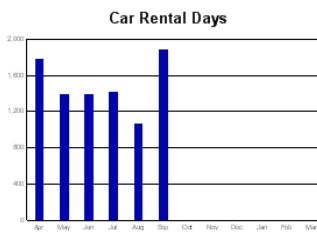
Executive Summary

From Branch: 205 **From NatCustomer Code:** 1 **From Customer Code:** 1 **Calendar Month:** September
To Branch: 205 **To NatCustomer Code:** ZZZZZ **To Customer Code:** ZZZZZ **Financial Year:** 2009 (1 April 2008 - 31 March 2009)

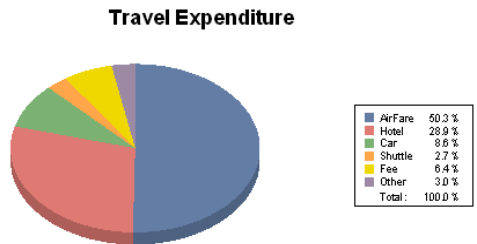
AirFare Analysis						
	Ticketed Fare	Full Fare	Saving	Saving%	No of Tlts	Avg Fare
Apr-08	3,647,432	3,784,497	137,065	3.62	1,166	3,128
May-08	3,942,956	4,154,853	211,897	5.10	954	4,133
Jun-08	5,771,398	5,807,480	36,082	0.62	1,024	5,636
Jul-08	4,416,051	4,843,780	427,729	8.83	1,127	3,918
Aug-08	3,268,869	3,252,001	-16,868	-0.52	1,008	3,243
Sep-08	4,670,776	4,469,535	-201,242	-4.50	1,065	4,386
Oct-08	0	0	0	0.00	0	0
Nov-08	0	0	0	0.00	0	0
Dec-08	0	0	0	0.00	0	0
Jan-09	0	0	0	0.00	0	0
Feb-09	0	0	0	0.00	0	0
Mar-09	0	0	0	0.00	0	0
Totals	25,717,483	26,312,146	594,663	2.31	6,344	4,054



Car Analysis					
	Total Rental Cost	Cars Rented	Rental Days	Avg Rate/Day	Avg Rental Days
Apr-08	981,031.98	573	1,765	564.88	3.12
May-08	642,187.90	423	1,394	519.16	3.30
Jun-08	679,921.99	422	1,394	542.24	3.30
Jul-08	739,071.46	453	1,423	559.86	3.14
Aug-08	591,468.37	361	1,075	611.60	2.98
Sep-08	756,255.88	505	1,889	524.14	3.74
Oct-08	0.00	0	0	0.00	0.00
Nov-08	0.00	0	0	0.00	0.00
Dec-08	0.00	0	0	0.00	0.00
Jan-09	0.00	0	0	0.00	0.00
Feb-09	0.00	0	0	0.00	0.00
Mar-09	0.00	0	0	0.00	0.00
Totals	4,389,938	2,737	8,960	489.95	3.27



Summary							
	Air Amt	Hotel Amt	Car Amt	Shuttle Amt	Fee Amt	Other Amt	Total Amt
Apr-08	3,647,432	2,604,151	981,032	183,808	592,750	217,013	8,226,186
May-08	3,942,956	2,316,571	642,188	53,288	406,923	358,652	7,720,578
Jun-08	5,771,398	1,711,256	679,922	86,599	437,033	325,470	9,013,678
Jul-08	4,416,051	3,701,491	739,071	702,913	665,691	242,367	10,467,584
Aug-08	3,268,869	2,010,435	591,468	126,285	544,579	461,627	7,003,263
Sep-08	4,670,776	2,414,415	756,256	239,290	616,160	432,008	9,128,905
Oct-08	0	0	0	0	0	0	0
Nov-08	0	0	0	0	0	0	0
Dec-08	0	0	0	0	0	0	0
Jan-09	0	0	0	0	0	0	0
Feb-09	0	0	0	0	0	0	0
Mar-09	0	0	0	0	0	0	0
Totals	25,717,483	14,758,319	4,389,938	1,394,183	3,263,136	2,037,137	51,560,195



Appendix D: SITTING PLAN

