Evaluation of Transwerk Risk Management Information System

Brian Vusumuzi Mpanza

Assignment submitted in partial fulfillment of the requirements for the degree of Master of Philosophy (Information and Knowledge Management) at the University of Stellenbosch

Supervisor: Mr. D. F. Botha

April 2005

Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature: **Date:**

Abstract

In the last decade, the use of computers has proliferated the industrial arena in South Africa. Due to frequent changes in computer programs and developments in the computing field, users have often been adversely affected. Users experience problems with computer programs that are not user friendly. Usability is about satisfying the user needs by allowing the user to accomplish their goals quickly, efficiently and easily. Thus it is crucial that industries invest in computer programs that offer optimum usability.

In this research an attempt is made to provide a framework for methodology that can be used to test and evaluate usability in the Transwerk Risk Management Information System, that is Computer Assisted Risk Management Systems (CARMS). I first consider the difference between unusable and usable programs. Usability properties are then identified including properties enhancing effectiveness, efficiency, flexibility, laernability and attitude of the computer program.

The CARMS components or modules and users were identified. Usability problems were identified that cause the users to be selective and discouraged to use other components of CARMS. To further verified and address the usability problems identified, the whole program needs to be tested and evaluated. The methodology was laid for how to do usability testing and evaluation in computer program that are currently in use like CARMS.

Benefits and limitations of testing and evaluating usability were detailed in this research. It is recommended that, testing and evaluating usability should be done to prevent errors, dissatisfaction and to improve usability of the CARMS program.

Opsomming

In die laaste dekade het die gebruik van rekenaars uitgebrei in die industriële arena in Suid-Afrika. Weens gereelde veranderings in rekenaar programme en ontwikkellings in die informatika veld is gebruikers gereeld nadelig geraak. Gebruikers ervaar probleme met rekenaar programme wat nie gebruikersvriendelik is nie. Bruikbaarheid het te make met bevrediging van gebruikersbehoeftes deur hulle in staat te stel om hulle doelwitte vinnig, doelmatig en maklik te bereik. Dit is dus van kritiese belang dat industrieë investeer in rekenaar programme wat optimale bruikbaarheid bied.

In hierdie navorsing word gepoog om 'n raamwerk vir metodologie wat gebruik kan word om die bruikbaarheid van die "Transwerk Risk Management Information System" (dit is "Computer Assisted Risk Management Systems" of CARMS) te toets en te evalueer. Ek bespreek eerstens die verskil tussen onbruikbare en bruikbare programme. Bruikbaarheidseienskappe word dan geidentifiseer, insluitend eienskappe wat doeltreffendheid, doelmatigheid, buigsaamheid, aanleerbaarheid en houding van die rekenaar program verbeter.

Die CARMS komponente of modules en gebruikers is geidentifiseer. Bruikbaarheidsprobleme is geidentifiseer wat veroorsaak dat gebruikers selektief raak en ontmoedig raak om ander komponente van CARMS te gebruik. Om verder die geidentifiseerde bruikbaarheidsprobleme te verifieer en adreseer moet die hele program getoets en evalueer word. Die metodologie is vasgelê waarvolgens bruikbaarheidstoetsing en evaluasie van rekenaar programme wat tans in gebruik is (soos CARMS) gedoen kan word.

Voordele en beperkings van bruikbaarheidstoetsing en –evaluasie is in hierdie navorsing vervat. Dit word aanbeveel dat bruikbaarheidstoetsing en –evaluasie gedoen moet word om foute en ontevredenheid te voorkom en om die bruikbaarheid van die CARMS program te verbeter.

Dedication

To my wife Ntokozo

Acknowledgements

My colleagues, Dumisani Mpanza, Larry Jowah and my Friends for their special support

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Chapter 1

Introduction

"What is a highly usable web site? Highly usable web sites are intuitive. They are transparent. They support the users, allow users to accomplish their goals quickly, efficiently, and easily. In contrast, poor usability means that people using your web site cannot efficiently perform the task you intended. Poor usability can come from overly complex web sites, can lead to large numbers of user errors or can mean that people just don't like using your system" (Brink et al., 2002)

Nowadays many companies have turned to computer programs or systems to do almost everything that needs to be done within the companies. This covers a range of tasks from production, administration, finance, maintenance, etc. This scenario has compelled the management of companies to invest in the usage of computer systems. Furthermore, designers who previously were designing computers for expert users have to cater for divers users of the computer.

Preece (1993), comments that more and more people use and depend on information technology. Be it the point of sale system in a supermarket, the automatic cash dispenser in a bank, the control system in a cockpit or the word processor in an office – all have become an integral and indispensable part of life. A big problem with this change is that most of us at some time or other have experienced frustration and difficulty when trying to use the technology. Much time and energy – and in some cases lives have been lost in this struggle.

Shackel and Richardson (1991), commenting about the growth and change of users in computing, say, "Earlier users were committed to using computers because of personal interest or job requirements. But the potential new users are such people as managers, physicians, lawyers and scientists who are committed to their task but not at all to the computer. They have a choice and will only to use computers if they are appropriate, useful and usable." Shackel and Richardson (1991), to explain the growth in computing resulting in or leading to a widespread range of usability problems as shown in Table 1.1.

Most of the information in a computer is found in web sites and companies are using this facility to advance their business interest. Brink, Gergle and Wood, (2002), "legacy information system have been given new life as businesses use the web to provide stored corporate knowledge to those who need it, both inside and outside an organization. Web-based applications have become a standard, cross-platform non-proprietary means for businesses to communicate with each other and with consumers"

Table 1.1: Growth of digital computers and user issues

Computer Type	**Approximately Growth Era**	**Main Users**	**Users Issues**
Research machines	1950s	Mathematicians Scientists	Machine reliability; users must learn to do all the programming
Main frames	1960s & 1970s	Data processing professionals supplying a service	User of the output (business managers) grow disenchanted with delays, cost, lack of flexibility
Minicomputers	1970s	Engineering and non-other computer professionals	Users must still do much programming; usability becomes a problem
Microcomputers (plus applications packages)	1980s	Almost anyone	Therefore usability is the major problem

Transwerk, like other organizations or companies, has joined this endeavor of using computers, to manage its information through the web system. In this research we will look at the Transwerk computer program, namely the Computerized Assistant Risk Management System (CARMS). This program is used by all divisions of Transnet for reporting and managing risk within the organization.

In this research we will be looking at the ways of evaluating the usability of the CARMS program and also the reason why this program should be evaluated for usability. The outline of the chapters that is as follows:

Chapter 2 looks at the reasons why in this age we still have unusable products. Usability problems and defects are explained. And we examine usable in products. These are products that have properties of usability and are usable. In this chapter we will look at the usability; all arguments about what it is, what literature says about it, differences between usability and usefulness, formulation of usability objectives, and the importance of usability.

Chapter 3 discusses the usability benefits to the user, and to the whole organization and also limitations. Chapter 4 discusses the CARMS program, explains its function and importance within the organization, as well as its relationship to risk management.

In chapter 5, we will look at usability testing and evaluation, and methods that can be used to evaluate usability in CARMS. In chapter 6, we look at CARMS usability. We discuss the reasons for CARMS usability evaluation, and clarify who the users are and which modules within CARMS they use. Users views about CARMS through checklist and interviews are included. Chapter 7 is a conclusion of the whole research.

In a first South Africa Human–Computer Interaction (2000), Koper, M. of Lotus Corp comment "Despite the enormous outward success of personal computers, the daily experience of using computers far too often is still fraught with difficulty, pain, and barriers for most people. The lack of usability of software and the poor design of programs are the secret shame of the industry".

Chapter 2

Unusable and Usable System

In this generation of knowledge, information is abundant and demands to be used in an organized manner. Efforts have been made to find useful and easy methods of retrieving, using and disseminating or passing this vast information. Unfortunately, there are still many factors that impede attainment of the ideal situation. Users of the products still experience difficulties in using most computer based products and systems.

Rubin (1994), mention that there are five reasons for hard-to-use products and systems, which are the following:

1. *During the product development the emphasis and focus have been on the machine or system, not on the person who is the ultimate end user.* This is due to traditional thinking of the engineers and designers who put more emphasis on the activity and forget about other two equal important factors, which are human nature and context components. Rubin (1994), when explaining this point uses the Bailey's Human Performance Model (see Figure 2.1). People need both activity and context components in a balanced manner so that they can function well and achieve an acceptable level of production. If one of these components is undermined or taken for granted that a person has to find ways to deal with the imbalance.

2. *As technology has penetrated the mainstream consumer market, the target audience has changed and continues to change dramatically. Development organizations have been slow to react to this evolution.* This problem emanates from history, when most users were experts who had knowledge and who were enjoying the challenges of sophisticated systems. Designers then end up making programs or systems that are challenging and difficult for the users. Unfortunately, we are now living in a period when user proficiency varies significantly from one context to the next. Users can now be widely categorized along the expert-novice continuum. The designers then have to adapt to the variety of user types by designing their programs in consideration of the type of end user such that both the expert and novice levels are accommodated.

3. *The design of usable systems is a difficult, unpredictable endeavor, yet many organizations treat it as if it were just "common sense."* Most of the designers have

taken usability as common issue that needs no special attention or certain specialization. However, usability is not as easy to achieve as many might think. Programs and systems have become more hard-to-use whilst the designers claim that they are usable. Usability needs to be considered from the designing phase and should be tested and evaluated repeatedly to make sure that the system or program is centered to a user.

4. *Organizations employ very specialized teams and approaches to product and system development, yet fail to integrate them with each other.* In many organizations the development of the system has been broken into individual pockets, where they have divided tasks per team during the design. Rubin (1994) makes an example of three components of a software product are the user interface, the help system and the written materials. There might be clashes if these three components are developed by separate individuals or teams. Now there is nothing inherently wrong with specialization. The difficulty arises when there is little integration of these separate components and poor communication among different development teams. Only if the components works well together will the product be viewed as usable and meeting the user's needs.

5. *The design of the user interface and the technical implementation of the user interface are different activities, requiring very different skills. Today, the emphasis and need are on the design aspect, while many engineers possess the mind set and skill set for technical implementation.* The challenge for designers and engineers has changed it is no longer the inside of the machine (how it works) now it is outside to the end user (how it communicates with the end user).

These five reasons are part of the problem that is still continuing as we finding programs or computer programs that are difficult or hard-to-use. The web site or any interface is a communication medium, where there should be a sender, a message and a receiver. These three components are important. A sender or a designer of the web site should have in mind, from the beginning, an idea of who will be the users of the web site. This will result in involving the usability components in the creation of the site.

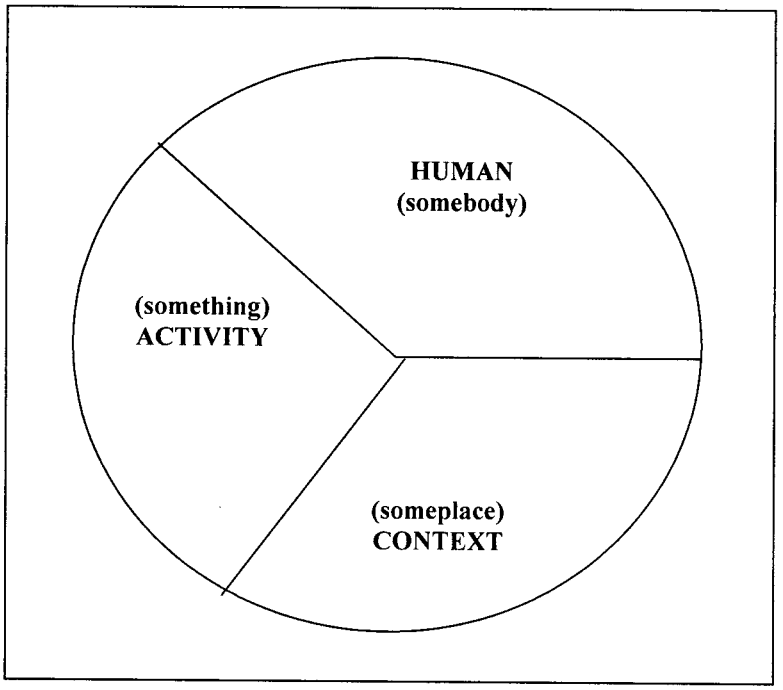

Figure 2.1: Baileys Human Performance Model

Usable sites have to "support the user, and allow the user to accomplish their goals quickly, efficiently and easily. In contrast, poor usability means that people using your web site cannot efficiently perform their task you intended" (Brink et al., 2002).

2.1 Usability Problems

There are four broad areas that mainly contribute to usability problems. They are human perceptions, navigation, human memory, and database integration. Brink et al., (2002) explain them as follows:

HUMAN PERCEPTIONS PROBLEMS

Perceptual problems can arise when pages are designed according to how the underlying information is physically stored rather than how the information can best meet the needs of the user. This strategy may make page delivery and maintenance efficient, but it can also make user's task slow and error prone. The problem arises when the designer chooses a presentation style (colour of the background versus color of the text or images, data layout

and graphics) without considering the users, and when he or she decorates the page with confusing or unnecessary features.

NAVIGATION

Navigation disorientation is among the biggest frustrations for the web users. Three common questions users ask themselves while navigating on the web are: Where am I now? How do I get where I want to go? And where does this go? To find a navigation path, users must predict what will happen if a particular link is pressed and determine whether it takes them closer to their goal. Also, ambiguous links are one of the navigation problems that cause the user to go to the wrong page. The symbols and features that are not standard or that are unfamiliar can cause the user to be lost. The other problem in navigation is consistency, when the designer does not use the same features to conduct the certain function.

HUMAN MEMORY

There are three primary human memory issues to be considered in the program:
First, if too many items must be remembered, it is likely that something will be forgotten. Second, the longer the time frame within which items must be remembered, the more likely they are to be forgotten. Third, the greater the similarity among the remembered items, the more likely they are to be confused with one another.

DATABASE INTERGRATION

As Web technology has matured, database systems have become a central tool for building web-base software applications. Although this approach is very powerful and can vastly streamline ongoing and maintenance, issues with integrating database technologies can create severe problems for the end user

Lindgaard (1994) add other usability problems or defects such as the following:

SCREEN DESIGN AND LAYOUT

The way information is presented on the screen and the nature of information to be entered could be problematic. For example problems may arise when the screen is crammed, or when there are too many alignment points to allow easy scanning.

FEEDBACK

This has to do with the way the system communicates with the users as a result of user's actions, or about the state of the system. For example, error or warning messages, confirmation messages, highlighting, regularity of response time.

CONSISTENCY

This refers to the degree to which the system performs in a predictable, well organized and standard fashion.

MODALITY

Modality is the state of the system operation that the user selects, to perform a particular function.

TERMINOLOGY

Words, sentences, and abbreviations should be familiar. Problems can occur when jargon is used inappropriately.

REDUNDANCIES

Unnecessary repetitions. Waste the users time.

USER'S CONTROL

Users are frustrated when they feel that they are not in control of the program.

MATCH WITH USER'S TASK

The degree to which the system matches task as carried out in the current environment and as specified in the task analysis.

Martinko, Henry and Zmud, (1996) mention that there are three core explanations for people's negative reaction to computer systems:

1. Internal attributes of an individual, such as the natural human tendency to resist change as well as certain personality characteristics and cognitive orientations;
2. Poor system designs (functionality, interface designs, modes of presentation, accessibility of workstation, inadequate response times, etc.) which not only amplify

negative reactions but can also frustrate those individuals who initially exhibit positive reactions, and;

3. The interaction of a system design with attributes of its users.

These explanations can be classified into two domains. The first explanation is mainly the attributes of individual behavior, but the second and the third are about the relationship between the human (user) and the system or technology environment.

2.2 Usability Defects

In addition to usability problems, usability defects compromise the effectiveness of computer programs. Some users end up not using the program or become selective while others, because of frustrations and confusion, turn away from using anything involving computers.

Booth (1990) supports the idea that sometimes, poor interface or program results in dissatisfaction and frustration to the users. Examples mentioned are the following:

- Designers do not properly understand the users, the users needs and the users working environment.
- Computer systems require users to remember too much information.
- Computer systems are intolerant of minor errors.
- Interaction techniques are sometimes used for inappropriate task.

According to Booth's (1990) to understand the concept of usability we need to understand what makes usable system easy to understand and operate. Just one or two constituents do not determine usability, but rather, usability is influenced by a number of factors. These factors do not simply and directly affect usability, but interact with one another in some complex way. Then Booth (1990) explains this relationship between variables by series of referring to Eason's casual framework of usability (see Figure 2.2).

System functions, task characteristics and user characteristics, which are independent variables, influence the dependable variable (user reaction) positively or negatively.

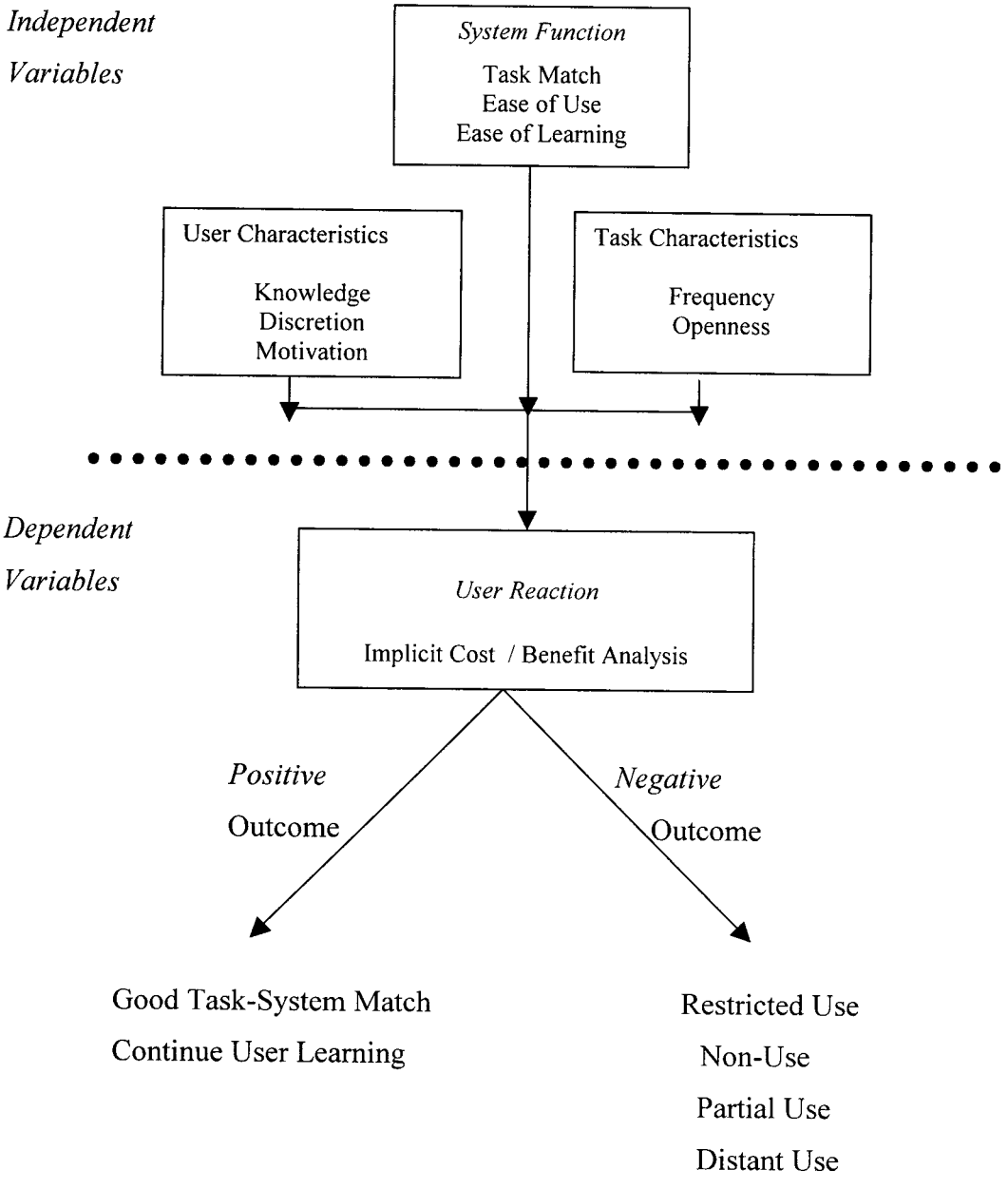

Figure 2.2: Eason's casual framework of usability

2.3 Usable system

In this part we will look at the usable products; all arguments about what usability is, what other literature says about usability, differences between usability and usefulness, formulation of usability objectives, and importance of usability.

2.4 Usability Definitions

There are many writers who have tried to define usability but only two definitions can explain this concept clearly. According to Lindgaard (1994) usability can be defined as follows:

i) "The capability in human functional terms to be used easily and effectively by the specified range of users, given specified training and user support, to fulfill the specified range of environmental scenarios".

ii) "The usability of a computer is measured by how easily and effectively it can be used by a specific set of users, given a particular kind of support, to carry out a fixed set of tasks, in a defined environments.

Brink et al., (2002) define usability as the degree to which people (users) can perform a set of required tasks. It is the product of several, sometimes conflicting design goals, that is functionally correct, efficient to use, easy to learn, easy to remember, error tolerant, and subjectively pleasing:

- *Functionally correct:* The primary criterion for usability is that the system correctly performs the functions that the user needs. Software that does not allow users to perform their task is not usable.
- *Efficient to use:* Efficient to use can be a measure of the time or actions required to perform a task. In general, procedures that are faster tend to be more efficient.
- *Easy to learn*: Ease of learning determines how quickly new users can learn to accurately perform a task procedure. In general the fewer the steps a procedure contains, the easier it is to learn.
- *Easy to remember:* The degree to which a system taxes a human memory determines how easy it is for users to remember. Systems that compel users to paste memory aids on their display screens are not easy to remember.
- *Error tolerant:* Error tolerance is determined by how well errors are prevented, how easily they are detected and identified when they occur, and how easily they are corrected once they are identified. Error-tolerant systems can also prevent catastrophic results if all other measures fail.
- *Subjectively pleasing:* In the end, usability is often determined by how well users feel about using the system. Although nonfunctional graphics and other interface elements can skew user's perception of usability. User satisfaction is probably a combination of all these criteria.

These goals can sometimes be conflicting, the designer and the nature or function of the program can determine priorities of the goals.

Rubin (1994) argues that user center design is the same as human factors engineering, ergonomics and usability engineering, and that the major difference is more geographical than approach and implementation. He also defines it as the practice of designing products so that users can perform required use, operation, service, and supportive tasks with a minimum of stress and maximum of efficiency. In elaboration he also mentions that the designer should "make the design fit the user" as opposed to "making the user fit the design". In supporting the above statement, Booth (1990) mentions that, " the emphasis is upon creating computer systems that support the user within an organization, rather than the user supporting the system."

Graham (2003) commenting about the designing user interface, " designed artfacts should be fit for their purpose. They should be natural in behavior and conform to the users expectations". Most of the time, designers of the programs or any computer products concentrate more on programs and tend to forget about the human who is a user of the program. Thus they design programs in a way that make the user fit the design.

Lindgaard (1994) argues the point about differences between usefulness and usability. He maintains that most designers and management concentrate on the usefulness of the system. For him, usefulness and usability are different and they are supposed to be assessed differently:

- A given system is useful to the extent that it covers adequately the range of tasks it is intended to support, whereas usability should be quantified.
- Usability is related to human performance in a specific task supported by a computer system and to the user's attitude towards the system, but usefulness is judged by different criteria.
- Usability is thus expressed in quantifiable, measurable terms by which to assess when a 'good' system is 'good enough'. Usefulness is a separate entity, which is defined in the requirements captured stage in terms of the task to be supported and explicit links between tasks. The attainment of task must be 100% unless renegotiated and modified during the system development.

Most of usability definitions cover all or most aspects of usability, where the main aim of the program is to satisfy the needs of the user. The main objective of usability is to support the user and allow users to accomplish their goals quickly, efficiently and easily.

2.5 Why Usability Is Important

According to Travis (2003) almost on a monthly basis independent surveys, highlight the amount of business lost by sites that are difficult to use. We read that people who want to buy products are unable to because of navigation difficulties; customers are unable to find the correct page to choose a product or are unable to find payment options. We read that sites crash, are under construction or are otherwise inaccessible.

So it is now obvious that web sites need to be usable. According to Randall (1998) usability test in the past took place largely in the worst possible arena: the marketplace. In other words, determining whether or not a product was usable was primary a task of the consumers, and only after the products release. The good news is that usability has finally come of age. The bad news is that usability is perceived as screen design; choosing the correct fonts, colors and icons. In fact usability is a process: it is not something that can be stapled on the end of the development.

Travis (2003) gives the percentage weightings to each of the three usability functions that need to be considered.

1. Screen Design

   Screen design plays a very small part in usability. This means that optimizing the colours, fonts, and icons on your site will improve usability by at least 15 percent. It is like the old adage: you can put a make-up on a pig, but it's still a pig.

2. Consistency

   Consistency accounts for about 25 percent of a web site usability. Inconsistency in a function is annoying and sometimes can results in frustration, or disastrous consequences for instance, in chemical plants control rooms.

3. Task focus

> Task focus accounts for the remaining 60 percent component of usability – you know a website has task focus when you get a warm feeling that the person who designed the site knew exactly what you wanted to do. The site works the way you expected.

There is also a fact that no industry can deny about the cost implications that computer programs have in both financial and human terms. There is lot of investment that industry has done on this field. The failure or malfunction of the program is costly to the companies whether it is due to the program failure itself or the users fail to use the program properly.

Programs need information to be fed into the system, which then avails it, through the Web, to everyone who needs it, both inside and outside the organization. According to Brink et al., (2002), web–based applications have become a standard, cross-platform and nonproprietary means for business to communicate with each other and with consumers. However, we have seen in the past that technology alone cannot achieve productivity. In fact, there is ample evidence that technology can decrease productivity if poorly applied. High usability is a key factor in achieving maximum return on information technology investments.

Chapter 3

Usability benefits

Bevan and Macleod (1994) they comment on the benefits of improved usability. "Most computers software are unnecessarily difficult to understand, hard to learn, and complicated to use. Difficult to use software wastes the user's time, causes worry and frustration, and discourages further use of software. What are the benefits of the usable software could bring to the employer (such as Transnet):

- Usable software increases productivity and reduces cost.
- Difficult to use software is time consuming to use, and not exploited to full advantage as the user may be discouraged from using advanced features.
- Difficult to learn software also increases the cost of training and of subsequent support.
- Usable software increases employee satisfaction.
- Difficult to use software reduces motivation and may increases staff turnover.

There are four key benefits from a customer–centered approach: higher revenues, loyal customers, improved brand value and process improvement.

1. Higher Revenues
   - Fewer changes down the stream means earlier time to market
   - Earlier time to market brings competitive advantage.
   - Customers use all of the sites functionality, not just a subset.
   - Early and continuous customers involvement reduces life cycle cost.
   - Customers cost less to service (they won't need to phone up to check if their order went through).

2. Loyal customers
   - Customers remain loyal – loyal customers generate repeat business, demonstrate immunity to competition, provide higher margins and less are price sensitive.
   - Value to customers is delivered in the first release of the site as well as in upgrades.
   - Free word of mouth exposure.

3. Improved brand value
   - Customers learn more quickly how to use the site.
   - Improved usability provides a competitive edge.
   - Higher service quality leads to improved customer satisfaction.
   - Customers can focus on their goals rather than on the web site; this leads to increased productivity and fewer errors.

4. Process improvement
   - Reduce rework to meet customer requirements: 80 percent of software rewrites are due to important functionality being missed in the first time.
   - The process keeps developers focused on important business metrics, such as conversion rate.
   - Development, marketing and external contractors improve communication and can be better orchestrate their efforts.
   - Risks are managed and reduced by helping users prioritize features and products offerings.

According to Randall (1998), nobody is going to argue that usability does not matter, especially in a market where steep learning curves are frowned on. The easier a product is to use, the more likely a customer will stick by it and upgrade to new version as they become available. But one problem with relying on usability testing is that the new features might be limited because their effectiveness was not immediately apparent.

Disadvantages

Companies have always recognized the need for usability testing of one kind or another, but formal testing takes time and money and can easily delay a products release. When usability testing is integrated with product development, the test results must be incorporated into design itself, and obvious this does nothing to keep the budget crunchers happy. But if the result is a more satisfied customer, then a bit more time and money is a smart investment. (Randall, 1998).

In South Africa the first Human-Computer Interaction (HCI) was on May 8-10 2000, Hugo (2000) reports that during the period of this Conference, there were not more than 5 full-time

HCI/Usability professional practitioners in the country, and only a handful developers have received any kind of HCI training. The shortage of experienced specialist in this field can hold us back in advancing in this field of usability.

Chapter 4
CARMS

In 1996 Transnet Risk Management decided to invest in a program that would help in consolidating all reports related to risk from all sub-divisions of Transnet. Transnet Risk Management outsourced the designing and running of the program to ReproRisk (PTY) Ltd Company (IT specialist). This program is run via the Internet to enable different plants and businesses under Transnet to have access.

Computer Assisted Risk Management Systems (CARMS) was developed to assist Transwerk Management as a member of Transnet Limited, to minimize the Cost of Risk at Transnet through the usage of quality Risk Management Tools. The CARMS program was introduced at Transnet in 1996 as a tool for reporting incidents and losses by the management from each Business division to the Transnet Executive Management Board. Through the years this system has expanded to be a tool to manage risk in Transnet as a whole.

CARMS is a general term for a set of risk-related program tools. Some of the tools (applications/modules) have been purchased from external providers, whilst others have been designed and developed in-house for use by all Transnet Business Units. The CARMS modules are exclusively available to Transnet Business Units via the World Wide Web (Internet).

4.1 CARMS Components

The components or modules of CARMS are as follows:

IRMA

The Intranet Risk Management Administrator (IRMA) is a module that provides for various functions, including the recording of all incidents and losses that resulted or could have resulted in losses to the organisation. Some features included in IRMA are as listed hereunder.

Administration of claims that resulted as a consequence of incidents, including–

- Injuries on Duty;
- Assets All Risk Losses/Damage;
- Motor Vehicle Losses/Damage, and
- Third Party Liability.

COST OF RISK (COR)

A module to record Cost of Risk information for the organisation in accordance with Transnet's Risk Management Standards.

AUDIT PROGRAM MANAGER (APM)

A module to plan and structure Risk and Environmental Auditing Schedules per Business Unit and per Type of Audit.

STANDARDS AND GUIDELINES

An electronic library module for references to all Risk and Environmental standards and guidelines.

NOSA AUDIT PROGRAM

A module to record scores/ratings of National Occupational Safety Association (NOSA) elements.

RISK ORGANISATIONAL CHART (ROC)

A web-based reporting module to indicate the organisational structure (organogram) of the Risk Management discipline within Transnet.

ENVIRONMENTAL SELF-ASSESSMENT PROGRAM (ESAP)

A module to record ESAP element scores.

ROOT CAUSE ANALYSIS (RCA)

A module to analyse the immediate and basic causes of incidents. In addition, the RCA program will provide for the registering and monitoring of corrective actions.

LEGISLATION

An application module with search and look-up facilities from documented legislation pertaining to Risk Management disciplines such as health, safety, security and other CARMS subjects.

TERMS

A module to record identified key risk by means of a top-down hierarchical structure linked to Transnet to evaluate, mitigate and control risk.

The above-mentioned CARMS modules are categorized under three segments, which are reporting, library and investigation analysis, of which 60% to 70% is reporting.

Reporting

- Incident, loss and claims manager (IRMA)
- Cost of risk
- Audit program manager
- Health and safety archive – medical surveillance
- NOSA audit program
- Environmental self-assessment program (ESAP)
- Risk identification and assessment manager

Library

- Standards and guidelines
- Risk organisational chart
- Legislation

Incident Investigation Analysis

- Root cause analysis that is Transnet Systematic Casual Analysis Technique (TSCAT)

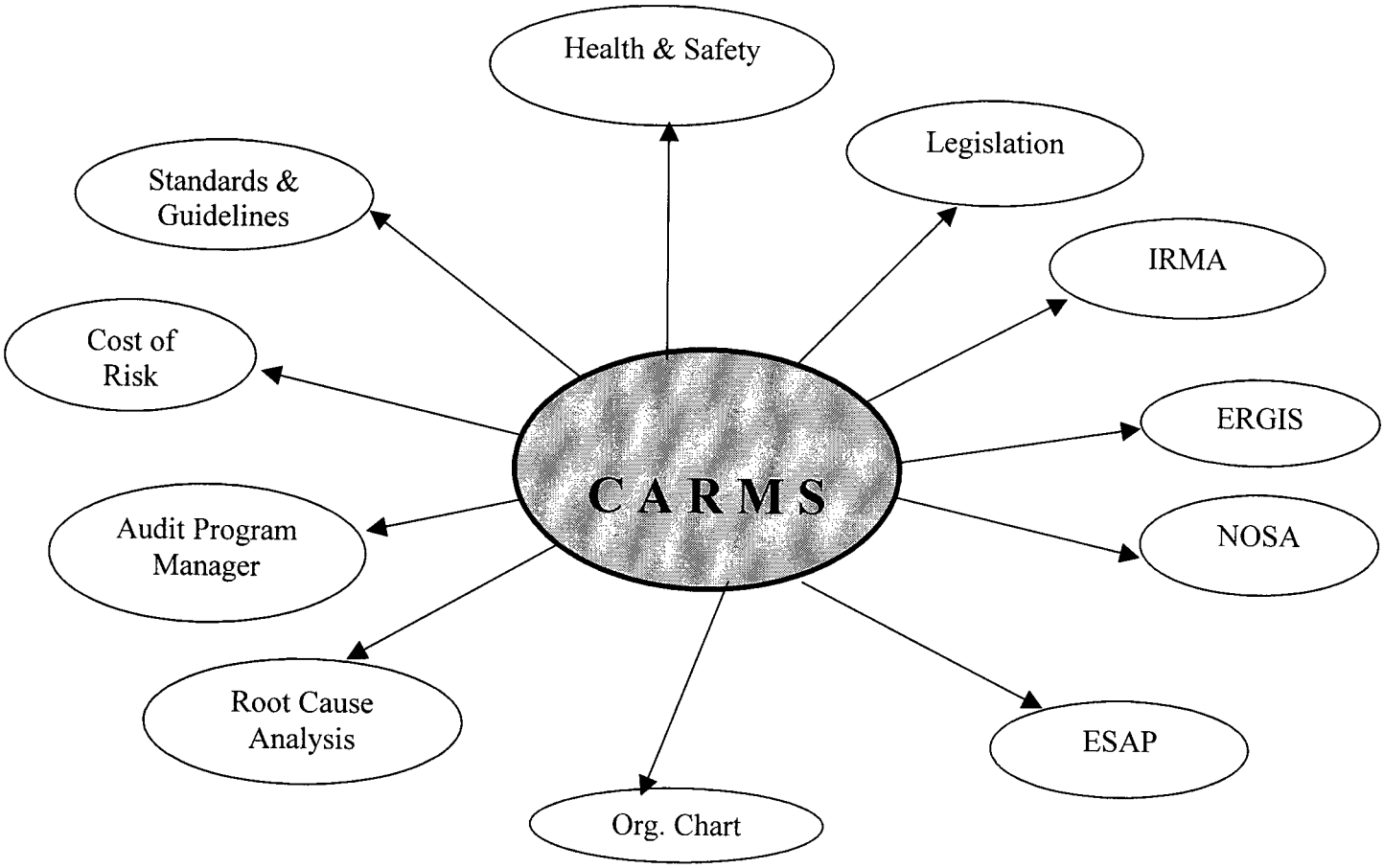

Figure 4.1: CARMS Modules (Schematically)

The CARMS reports are filled out by Injury On Duty clerks, Risk Officials and Risk Managers of each plant then sent to Co-operate Office, then the Risk Co-operate Manager combines all Transwerk plants reports and sent them to Transnet Risk Management. The Library is for references of all Transnet standards and guidelines, all relevant legislations and risk Organizational chart. Then the TSCAT is for incident investigations recording and analysis.

As already pointed out, Brink et al., (2002), define usability as a degree to which people (users) can perform a set of required tasks. It is the product of several, sometimes-conflicting design goals, that are functionally correct, efficient to use, easy to learn, easy to remember, error tolerant, and subjectively pleasing. The designer and the nature or function of the program can determine priorities of the goals. For the CARMS program, being functionally

correct, efficient to use, easy to learn, easy to remember and error tolerant are important goals to perform the required task by the users.

4.2 Transnet and CARMS

Transnet is a parastatal organization in South Africa that has 10 business divisions, which are Spoornet, Metrorail, Petronet, Transwerk, South Africa Airways, Portnet, South African Port Operations, Propnet, National Ports Authority, Transtel and Freight-dynamics. Transnet main business with its divisions is to supply and make available, means of transport whether on air, land or sea, to all South Africans.

Transwerk is an engineering division of Transnet Limited, based in South Africa, comprising a group of product-focused businesses in refurbishing, upgrading and manufacturing of railway rolling stock, as well as spares and associated transport equipment.

Transwerk has a workforce of ±5000 employees in 7 plants, situated in different parts of South Africa. Transwerk began its operations almost a century ago as the Mechanical Engineering Workshop of the South African Railways and grew in unison with the expansion of railways in the region. By 1990 when its owner, the South African Transport Services registered as Transnet Limited, Transwerk was formed as a separate division and now operates as a portfolio of six national product-focused businesses being Components, Locomotives, Coaches, Wagon Build, Rail Freight Refurbishing and Tarpaulins.

The functions of these six different Businesses are as follows:

1. Components Business - The Components Business is primarily involved in the refurbishing, upgrading and manufacture of components for railway rolling stock.
2. Locomotive Business - Locomotive business specializes in the general overhaul of AC and DC electric locomotives and Diesels and is the leading locomotive repair and upgrade facility serving the Southern African Market.
3. Coaches Business - Coach Business refurbishes all types of passenger coaches and allied rolling stock such as guards-vans, motorcar wagons and steam-heat-vehicles
4. Wagons Business - Wagon Build is involved in the manufacture and assembly of railway freight wagons for the domestic and overseas markets.
5. Rail Freight Refurbishment (RFR) -RFR business provides technical solutions to various clients in Africa by refurbishing freight rolling stock and providing related

products and services including, wreckage repairs, modifications, conversions and upgrading.

6. Tarpaulin Business - The Tarpaulin Business is in the manufacture, repair, washing and leasing of PVC coated fabrics and auxiliary equipment for the domestic and international markets with particular strengths in the rail and road transport sector.

In Transwerk there are also support Businesses, namely, Human resources, Engineering, Finance, Information Technology, and Industrial park. The Industrial Park business comprises Risk, Assets and Maintenance departments. Risk management is the main function of the Risk department in Transwerk. Risk management is a management function with the objective of protecting people, assets, environment and income by avoiding or minimizing the potential loss from pure risk, and provision of funds to recover the losses.

4.3 Risk Management

Risk management is the main function of the Risk department in Transwerk. This is a management function with the objective of protecting people, assets, environment and income by avoiding or minimizing the potential for loss from pure risk, and the provision of funds to recover the losses. Although there are many different types of risks that businesses encounter such as finance, resource management, marketing, etc., for the purpose of this evaluation CARMS deals with one that is Pure Risk.

4.4 Pure Risk Management

Pure risk involves health, safety, and environment the components of which are defined as follows:

- Health: This means the health of employees or people who can be affected by activities of the company, e.g. occupational health diseases.
- Safety: This means prevention of incidents that can result in personal harm or fatality, also involves prevention of property damage, theft, fire and
- Environment: The importance of taking care not to pollute air, ground and water.

Greene and Serbien (1983) argue that there is a relationship between risk, uncertainty and profit; that as risk increases, so does profit. In a reckless society, according to this philosophy there would be no profit. Most of the companies are proud of the profit they make but forget to count the costs of pure risk that involves prevention cost like insurances, security, protection controls, education and awareness and also treating occurred situations i.e. injuries cost, property damage, environmental incidents, fire incidents, etc. In other words in any company, from the profits that were supposed to be made there is a portion that is taken by cost of pure risk. Then it is essential for any company to manage pure risk.

Management of pure risk does not focus only on preventing the loss of profit; it also concentrates on safety of employees, property and environment. The South African law has made risk management essential to be considered in the companies. The principles of reducing the risk are to identify all loss exposures, evaluate the risk in each exposure, develop a plan and monitor the risk in their companies.

South African Constitution states that every person has the right to life and also there is an implication that every employee has a right to safe and healthy working environment. Also the Occupational Health and Safety Act, 1993 section 8(1) states " Every employer shall provide and maintain as far as reasonably practicable, a working environment that is safe and without risk to the health of his employees." Section 10 (1) states "Any person who designs, manufactures, imports, sells or supplies any article that is safe without risks to health when properly used and that it complies with prescribed requirements".

Heiber (2004) when commenting about King II report, says that risk management is central to good corporate governance because it closes the loop between strategic initiatives and day-to-day operational performances. It also provides the foundation for dynamic goals setting, balance scorecards, and guided analysis. This requires the following:

- A commitment by management to the process.
- A demonstrable system of risk mitigation activities.
- A system of documented risk communications.
- A system of documenting the cost of non-compliance and losses.
- A document system of internal control and risk management.
- An alignment of assurance of efforts to the risk profile.

- A register of key risks that could affect the shareowner and relevant stakeholder interest.

In order to implement the Risk management relevant issues that the King II report proposes Transnet uses CARMS for communicating and collecting data or information. Transwerk management is evaluated by using a balance scorecard of which one of the elements for evaluation comes from CARMS (e.g. Cost of risk, ESAP, DIFR, etc.).

Heiber (2004) also explains the balance scorecard as an approach to provide an easy-to-use interface for tracking and analyzing organizational performance. If executed correctly, users get an immediate and intuitive view of the current status with stoplights and trend arrows that show current performance versus predefined thresholds. It allows managers to review the current status of any project or activity and focus on the most important issues by sorting goals by status, trend and initiative.

Risk Department employees are end users of this program because, they are the ones who feed the information to different modules in the CARMS program and send that information to Cooperate Office. Then the Cooperate Office consolidates all reports from different plants into one Transwerk report that will be sent to Transnet Risk Management Group. Based on this information, decisions and targets for controlling and elimination of risks in Transwerk are taken and reported back to management as part of the balance scorecard system.

Data from the CARMS is imperatively important to Transwerk as a whole and the Transnet Risk Management Group. Therefore the accuracy of information is important and employees are expected to utilize relevant modules and tools that are in their disposal.

This research project is undertaken to highlight the fact that computer programs, whether in-house or outsourced (like CARMS), need to be tested and evaluated for usability. It also explains the relationship among the concepts, usability, testing and evaluation of usability; and suggests methodology that can be used to identify usability defects, and how to conduct test and evaluation of usability.

Chapter 5

Testing And Evaluation Of Usability

Travis (2003) comments that all software undergoes functional testing, where the system is examined to eradicate system crashes and other bugs. But remarkably though it sounds, a significant proportion of software reaches computers without undergoing usability testing. With websites the problem is greatly magnified.

The common argument is that usability testing takes too long and costs too much money. However, if we fact consider the lifetime of the project, usability testing saves time and money. This is because usability problems get fixed before the release (when it is cheaper and quicker to fix them) rather than having to wait for real customers to experience problems. Another argument is that many development teams simply do not know how to measure usability".

There are two types of usability evaluation that can be used according to Totterdell et al., (1990). There is formative evaluation, which is performed during development of a system, and summative evaluation, which is evaluation of the final system. For the sake of this research, since the program in question is already in the running phase, we will concentrate on summative evaluation.

5.1 Usability Aspects

There are aspects or dimensions of usability that need to be considered and they are effectiveness, efficiency, flexibility, laernability and attitude. These usability aspects can be used during evaluation of the system because they are measurable. Booth (1990) explains these aspects of the usability as following:

EFFECTIVENESS

Effectiveness refers to levels of user performance, measured in terms of the speed and/or accuracy, in terms of proportions of tasks, proportions of users or probability of completion of a given task.

This involves the following:

- The required range of tasks, completed at a specified level of performance, within a certain time (i.e. speed, accuracy)
- By some required percentage of the specified target range of users.
- Within some required proportions of the range of usage environment.

Also Faulkner (2000) explains this as one of the attributes of usability engineering as follows:

- The success to failure ratio in completion of the task.
- The frequency of use of various commands or of particular language features/functions.
- The measurements of user problems.
- The quality of the output.

EFFICIENCY

Efficiency can be a measure of the time or actions required to perform a task. In other words efficiency comprises of effectiveness as well as effort/speed. This attribute can also, according to Faulkner (2000), mean:

- Time required in performing a selected task.
- The number of actions required in performing a task.
- The time spent looking for information in documentation.
- The time spent using on-line help.
- The time spent dealing with error.

LEARNABILITY

Learnability refers to the ease with which new or occasional users may accomplish certain task. This involves the following:

- Within a certain specified time, relative to the beginning of user training;
- Based upon some specified amount of training and user support
- Within some specified relearning time, each for intermittent user

This is one of the most important attributes because the user of the new system meets them by trying to learn to use the system. If it is difficult for the users, they become demoralized and discontinue using it. But if the system is easy to learn then the user becomes interested in using it.

FLEXIBILITY

Flexibility refers to variations in task completion strategies supported by a system. This should allow adaptation to some specified percentage variation in task and/or environments beyond those first specified.

ATTITUDE

Attitude refers to user acceptability of the system in question. This involves the following:

- Within the acceptable levels of human cost in terms of tiredness, discomfort, frustrations and personal effort;
- So that satisfaction causes continued and enhanced usage of the system

5.2 Why Testing Usability

Rubin (1994) says usability testing is to refer to a process that employs participants of the target population to evaluate the degree to which a product meets specific usability criteria. The same writer also mentions the goals of usability testing as to identify and rectify usability deficiencies existing in computer-based and electronic equipment and their accompanying support materials prior to release. The intent is to ensure the creation of products that:

- Are easy to learn and to use.
- Are satisfying to use.
- Provide utility and functionality standards that are highly valued by the target population.

The main aim of a testing and evaluation plan according to Lindgaard (1994) is to ensure that testing is incorporated into system design and development process, that test results are integrated into development, and that sufficient resources are allocated to carry out the activities specified in it.

There are many explanations why testing is important, where designers have to prove that their product will address the usability quest. In other countries they have already started to have legislation or regulation for usability e.g. in Europe since 31 December 1992, they have legislation that requires hardware and software to meet certain standards with respect to systems usability and usefulness.

Testing and evaluation of usability help the customer to know that the product is usable and also helps the designers to know the defects or shortcomings and rectify them before the product goes to the market. Even programs that are already in the market (e.g. CARMS) and are in operation can be evaluated and all findings and deviations can be rectified in upgraded version of modules of those programs. And also this will help to know the status of this program in terms of usability and this test will be not done like dummy project but will be done from the real users.

The purpose of doing assessment should be clear and objective, because there are many reasons why one can do evaluation to the system. During the evaluation there are different aspects that come out of it i.e. determination of the kinds of tasks, tests, performance measures and attitude scales, interviews or surveys.

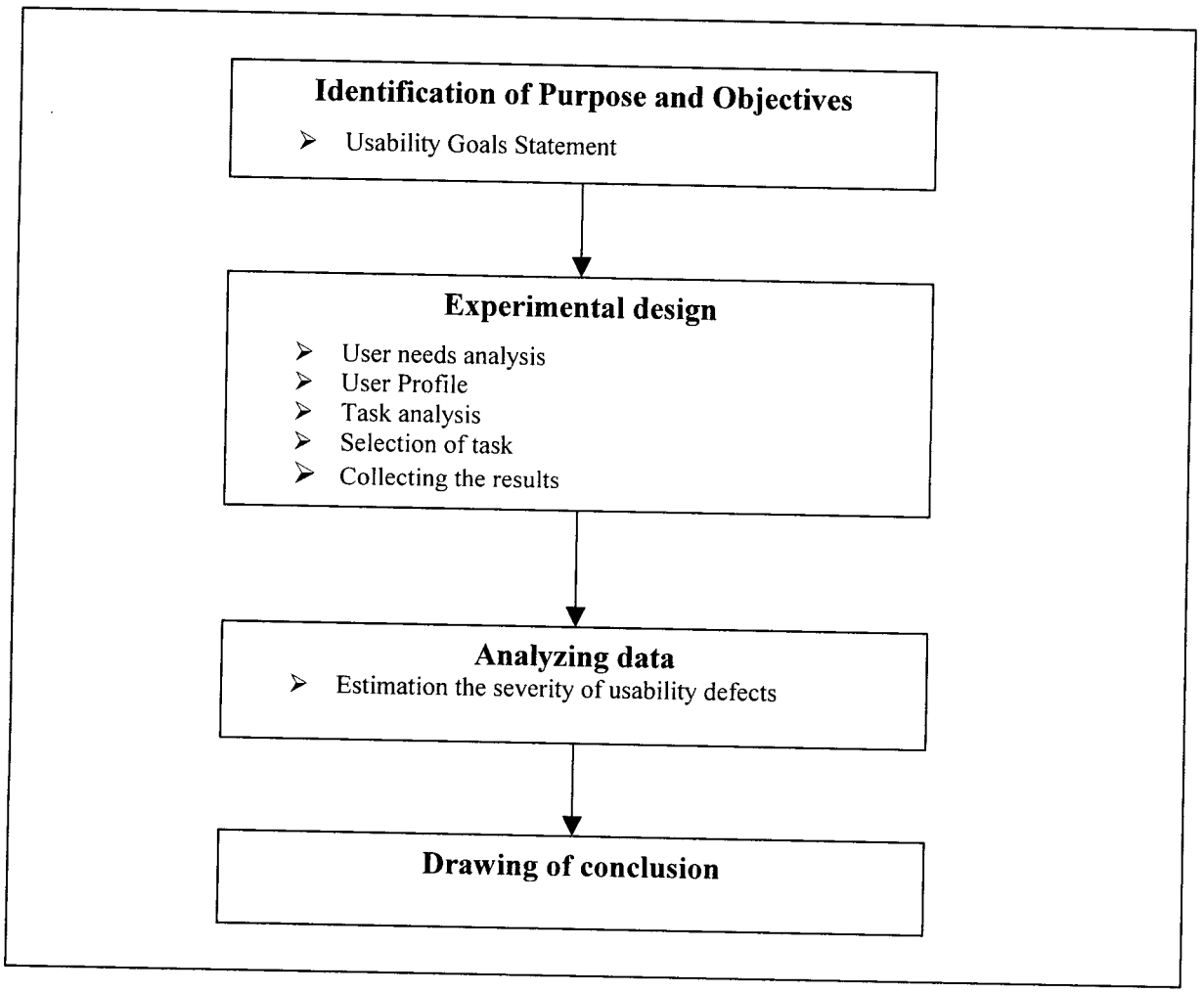

Figure 5.1: Summary of usability evaluation steps

5.3 Methods Of Usability Testing And Evaluation

There are many different methods of testing in literature. Some are similar while some differ only in terminology, but I will suggest the methodology that is laid out by Lindgaard (1994) and Totterdell et al., (1990) as mainframe for testing and evaluation of usability that we can use. There is some other information that I have borrowed from other literature to clarify certain issues.

Totterdell et al., (1990) propose essential steps needed for evaluation, which includes the following:

- Identifying the purpose or objectives of the evaluation. This includes identifying: the commissioner of the study, audience and most importantly the criteria or reasons of the study.
- Experimental design. This includes prior identification of suitable methods, subjects, tasks, measurements, experimental setting, and resources.
- Analyzing data. This involves using suitable analysis frameworks or statistical techniques or both.
- Drawing conclusion. This involves either making recommendations for modifications to the system or making generalized observations and further proposals for evaluation or concluding that every thing is satisfactory.

The above-mentioned steps are explained in detail below, to find out how and why we should follow them.

5.4 Identifying The Purpose Of The Evaluation

USABILITY GOALS STATEMENTS

The goals of usability should be in a statement form that is clear, objective and precise because they are supposed to be measurable. By setting usability goals we are supposedly making usability a specific design objective, according to a comment by Booth (1990) who also mentioned "a system might only be usable as its usable goals. In other words, if we choose inappropriate goals then, no matter how well we meet these goals, the system will still

fall short of being usable. Furthermore, the degree to which a system fails to meet usability demands may be proportionate to the gulf between the goals we set and the needs of the user".

According to U.S. department of Health and Human Services, usability testing encompasses a range of methods for identifying how users actual interact with a prototype or a complete site. In a typical approach, users – one at a time or two working together – use the web sites to perform tasks, while one or more people watch, listen, and takes notes. The goal of usability testing is to find out what is and is not working well on the site (or other product or service). In a usability test, you usually want to answer questions like these:

- Do users complete a task successfully?
- If so, how fast do they do each task?
- Is that fast enough to satisfy them?
- What paths do they take in trying?
- Do those paths seem efficient enough to them?
- Where do they stumble? - What problems do they have? – Where do they get confused?
- What words or paths are they looking for, that is not now on the site?

Lindgaard (1994) emphasize the importance of these goals that, "negotiations about what is to be improved by how much in a new system must take place very early in the process to ensure that:

- All involved know what must be achieved;
- All agree with the levels aimed for;
- The hardware/software platform selected makes it possible to achieve the goals within the time and cost limits.

The project team should also decide which of the four usability dimensions are important and relevant to the project".

5.5 Experimental Design

USER NEEDS ANALYSIS

Generation of user needs analysis should be, and it entails the following:

- User-needs analysis should be define and describe who are the users and what they are required to do.
- Identification all task in user's function.

- User's task demands in terms of physical characteristics and environment.

The user's –needs analysis is an analysis of everything that the users doing comparing the present and future task, and also description of the equipment and environment.

USER PROFILE

A user profile describes a number of characteristics of the users whose needs and requirements must be met in a new computer system. The purpose of the user profile is to ensure the following:

- The right level of terminology is employed (no jargon)
- User disabilities are considered (e.g. user's who have poor vision, poor hand-eye motor coordination or restricted of limbs movement)
- Level of computer literacy
- The user profile check list can be developed this should have the following information:
  - Level of users (Primary/secondary/Tertiary)
  - User knowledge and experience
  - Computer literacy
  - System experience
  - Application experience
  - Use of other systems
  - Task experience
  - Typing skills
  - Physical characteristics

There are three categories of users of the system (especial for CARMS program) that we will consider in this evaluation are:

- Primary users – are actual end users, those who user this system and feed the information (e.g. in CARMS program Risk Managers and Risk officials).
- Secondary users – are the recipients of reports (e.g. Transwerk Cooperate Risk Manager and Transnet Risk Manager)
- Tertiary users – are people who are responsible for the day-to-day maintenance of the system, the managers of other systems, policy makers and so on.

These categories of users are important in taking decision on user interface, the interactive dialogue and presentation style. Primary users interact mostly with the system, and as a result they are the first to be considered. Thus, however does not that other users view they are supposed to be ignored; they are also important for a comprehensive understanding of user needs or patterns. This information for user profile can be collected through different methods like interviews, check list or survey, any data collection method.

TASK ANALYSIS

There are number of task analysis methods in the literature that can be used, of which all describe and analyze what people do at different levels, and with various emphasis. Regardless of which task analysis method is used, there should be systematic steps followed to organize, collection and analysis of the data and also selection of task to be analyzed. The following four steps should be done:

- Define the purpose (why is this done?)
- Collect data (where does it fit, subtask, strategies)
- Analyze data (what do these data do for system)
- Model task domain

These four steps should apply in each and every task as indicated in task plan. Then the rational and criteria for success should be identified. This will lead to identification of goals including sub-goals where necessary. To attain this goals there should be strategies that are supposed to be used and also procedure (s).

SELECTION OF TASK

It is general impossible to test all tasks. The user performance measured in the test task must be interpreted in the light of the usability goals. Then these tasks should be classified accordingly in three different classifications as follows:

CRITICAL TASKS are those with which a certain level of risk or danger is associated and which therefore must meet very stringent demands on performance from both user and system. This type of task must assume the highest level of priority in a well designed test and evaluation plan.

TYPICAL TASKS are those tasks that are usually identified during heuristic evaluation, this evaluation brings to the surface the hidden typical tasks that are difficult to identify without testing them.

POTENTIAL TASKS are those that are identified through fixing the usability defects. These potentially problematic features are therefore built into task scenarios that represent part of the tests selected for benchmarking.

This classification of tasks is generated from results of user needs analysis, task and user profiles. The critical tasks should be at the top of the list as they are the first to be considered.

5.6 Collecting The Results

USABILITY TEST

Critical, typical and potential tasks are identified from user's needs analysis, typical usability defects. Thought must be given to amalgamating this information into the test plan. Then a decision should be taken for which suitable test should be done.

KNOWLEDGE ELICITATION METHODS

Elicitation methods are devised to learn more about how users perceive their task and what they encounter during task performance, or how they judge task similarities. This includes:

- Protocol analysis – A protocol is a verbal account given by the people who perform the task.
- Question asking protocol – The analyst poses questions to the user.
- Judging task similarity – To use repertory grids, the analyst select tasks components in groups of three and the respondent is asked to judge similarities and different between components.
- Content analysis – it consists of techniques with which to code or categorize written or spoken information into set of descriptive categories in a selective, systematic and reliable fashion.

INSPECTIONS METHOD

Inspections methods are investigative tools design to uncover inconsistency, controversy, and other user stumbling blocks. The project team or a team of evaluators work through typical task or deliberately seek to crash the system by performing unexpected actions and testing the system to its limits. The method this includes:

Heuristic Evaluation

Heuristic evaluation – is an informal, subjective usability analysis, conducted from the perspective of intended, typical end user. According to Neilsen (2002) heuristic evaluation does not provide a systematic way to generate fixes to the usability problems or a way to assess the probable quality of any redesigns. However, because heuristic evaluation aims at explaining each observed usability problem with reference to established usability principles, it will often be fairly easy to generate a revised design according to the guidelines provided by the violated principle for good interactive systems. Also, many usability problems have fairly obvious fixes as soon as they have been identified.

Neilsen (2002) came up with 10 Usability Heuristic Principles of which can be guidelines for designers so that they can eliminate some of usability problem.

Visibility of system status

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

Match between system and the real world

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. It should follow real-world conventions, making information appear in a natural and logical order.

User control and freedom

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Supports undo and redo.

Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

Error prevention

Even better than good error messages is a careful design, which prevents a problem from occurring in the first place.

Recognition rather than recall

Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

Flexibility and efficiency of use

Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

Aesthetic and minimalist design

Dialogues should not contain information, which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Help users recognize, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

According to Lindgaard (1994) heuristic evaluation has advantages and also disadvantages as follows:

Advantages

- It is quick to perform.
- It is relatively inexpensive.
- It can uncover lots of potential usability defects.

Disadvantages

- Several evaluations must usually be performed for maximum benefit.
- It is ideally done by experts.
- There is highly probability of false alarm.
- It is not always easy to distinguish between trivial and serious problems

CONFIRMATION STUDIES

Confirmation studies – are usually conducted to ensure that usability goals are being met, and also to confirm findings arising from other studies, for example heuristic evaluation. Heuristic evaluation surfaces number of problems that need to be sorted out so that the real or serious problems can be attended. Confirmation studies help sort this problems. This is done to confirm if the problem in question does cause problem to the user.

According Lindgaard (1994) this can be done by the following:

- Decide which problems to investigate.
- Design tasks that expose the problems to be verified.
- Decide how to order these tasks into experiments.
- Decide how many experiments to run.
- Decide which measures to take to assess user performance.

INTERVIEWS AND SURVEYS

Interviews and surveys – confirm that all types of users (primary, secondary, tertiary) are satisfied with the product, that its usability is acceptable, and the system provides the outputs users require, in the format they want.

According to Lindgaard (1994), the golden rules of successful interviews are as follows:

- The interviewee has access to the right information.
- The aim of the interview is clear into the interviewee.
- The interviewer is interested but neutral during the interview.
- A debriefing session is offered at the end of the interview.

Lindgaard (1994) also mentioned the reasons for conducting the interviews or a survey as following:

Interviews

- Provide access to people who cannot complete questionnaires;
- encourage exploration of ideas and suggestions;
- offer room of flexibility;
- direct interaction with interviewees;
- permit deeper questioning;
- allow clarification on both sides, and
- include background and context.

Survey

- Are easy to administer and process;
- are less likely to embarrass respondent, and
- are faster to analyze as the major effort is in preparation.

In interviews and surveys, the most important step is to plan properly and analyze the data correctly.

There are other methods that can be used to collect the information like, cognitive walkthrough that is used to identify missing steps, information, links, before coding and controversies emerge. Another method is a laboratory experiment where the user of the system is observed. All these methods are more useful before the system is implemented.

Before any tests are done the following question should be taken into consideration:

- Which tests will be conducted?

- When in the process will they be carried out?
- How much time must be allocated to preparations, test sessions, data analysis, reporting discussing results with the test or project team?

5.7 Analyzing Data

ESTIMATE THE SEVERITY OF USABILITY DEFECTS

All usability identified and tested should be rated from high, medium and low severity. Three dimensions in the usability defective index are considered namely:

1. The impact on the user performance (i.e. how difficult it is for users to continue their task and how long they are likely to spend recovering from it).
2. Probability of occurrence (how likely is it that users will encounter the defect?).
3. Frequency of occurrence (is it likely that the problem will be encountered only once, very often, sometimes or hardly ever?).

As Table 5.2 shows, each usability defect is given a rating along each of the three dimensions while (Table 5.1) allows us to classify it as critical, high, medium or low in severity. These classifications help us decide how and when different defects must be dealt with.

Table 5.1: Dimensions in the usability defect severity index

	IMPACT	PROBABILITY	FREQUENCY
High	User cannot continue or >25% of total task-time is spent recovering	All users (100%)	Very often (>50%of tasks)
Medium	Some impact, user can continue but spends up to 25% of task-time recovering	Some users (up to 50%)	Sometimes/often (10-49% of tasks)
Low	Users are hardly affected	Hardly any users (<10%)	Hardly ever (0-9% of tasks)

Table 5.2: Usability defect index

	Imp	Prb	Frq	Defect classification
1	H	H	H	Critical
2	H	H	M	High
3	H	H	L	High if early task, otherwise medium
4	H	M	H	Critical
5	H	L	L	Medium
6	H	M	M	High
7	H	M	L	Medium
8	H	L	M	Medium
9	H	L	H	Medium
10	M	H	H	High
11	M	M	H	High
12	M	L	H	Medium
13	M	H	M	High
14	M	H	L	Medium if early task, otherwise is low
15	M	M	M	High
16	M	M	L	Medium
17	M	L	M	Medium
18	M	L	L	Low
19	L	H	L	Medium
20	L	H	M	Medium
21	L	H	L	Low
22	L	M	H	Medium
23	L	M	M	Medium
24	L	M	L	Low
25	L	L	H	Medium
26	L	L	M	Medium
27	L	L	L	Low

Note: Imp = Impact; Prb = Probability; Frq = Frequency

Travis (2003) prioritizes usability problems in three dimensions as follows:

- Consequence: what effect does it have on customer?
- Frequency: how often will customer be affected?
- Magnitude: how many customers affected?

A low consequence problem is one that would cause a typical customer to, also (see Figure 5.2) the flow chart for usability problems Low consequence below:

- reread a sentence or a word;
- draw attention to poor aesthetics;
- 'Undo' an error (for example, use the 'Back' button);
- slightly delay task completion; or
- feel a bit dissatisfied.

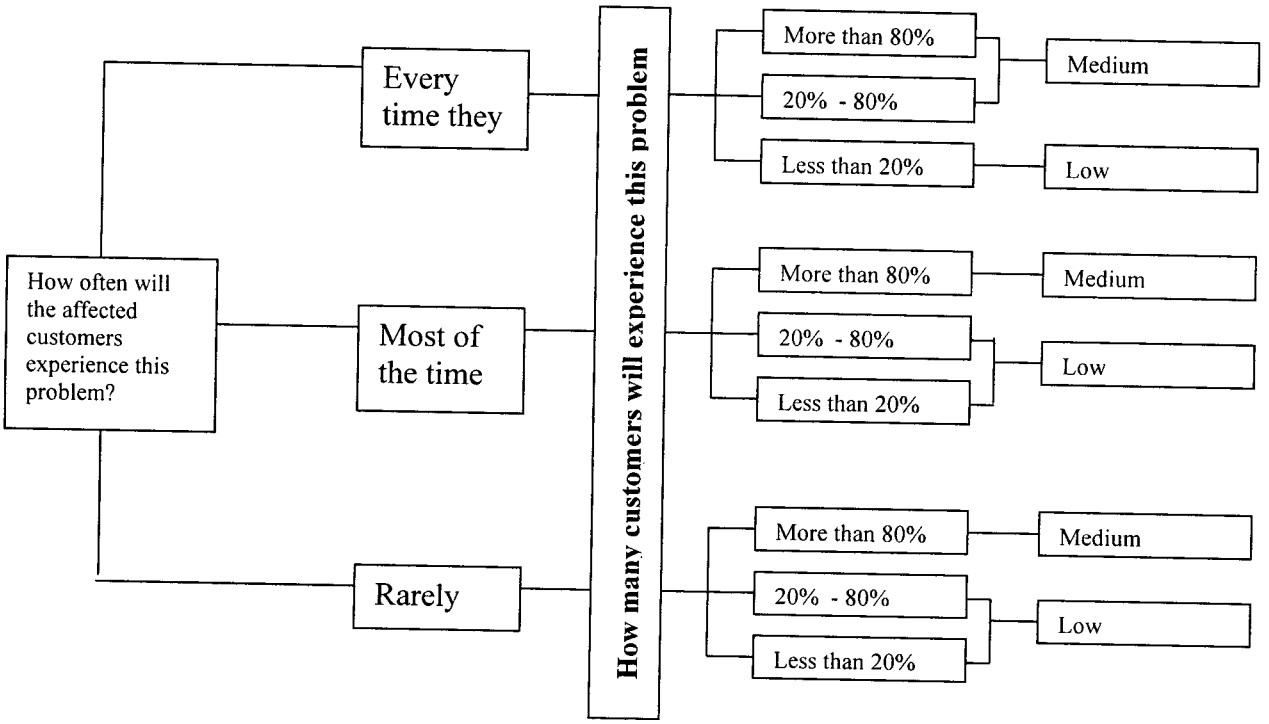

Figure 5.2: Flow chart for usability problems: Low consequence

A medium consequence problem is one that would cause a typical customer to,

- ignore instructions, prompts or link because they are unclear or because they cannot be read (for a example, instruction they disappear too quickly or they are written in small font);
- enter false or erroneous information (by accident);
- feel frustrated or angry;
- seriously delay or task completion;

- have to look for (and find) a work around;
- miss important functionality because it cannot be found;
- deviate from the 'ideal path' to complete the task (but still complete the task); or
- access online help.

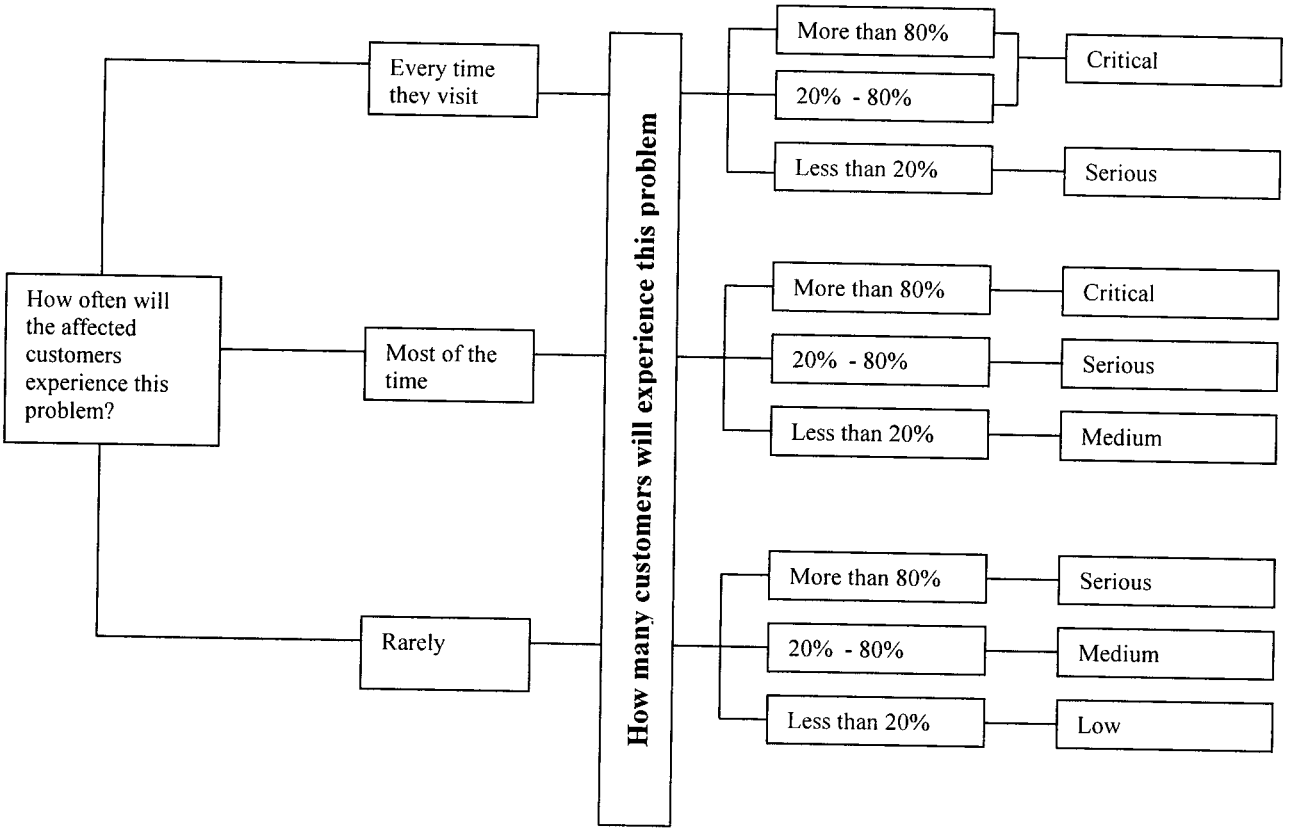

Figure 5.3: Flow chart for usability problems: Medium consequence

A high consequence problem is one that would cause a typical customer to,

- damage his or her computer or cause the computer crash;
- make an error that cannot be corrected easily;
- fail to complete the task;
- leave the website with his or her goals incomplete; or
- phone the help desk or technical support.

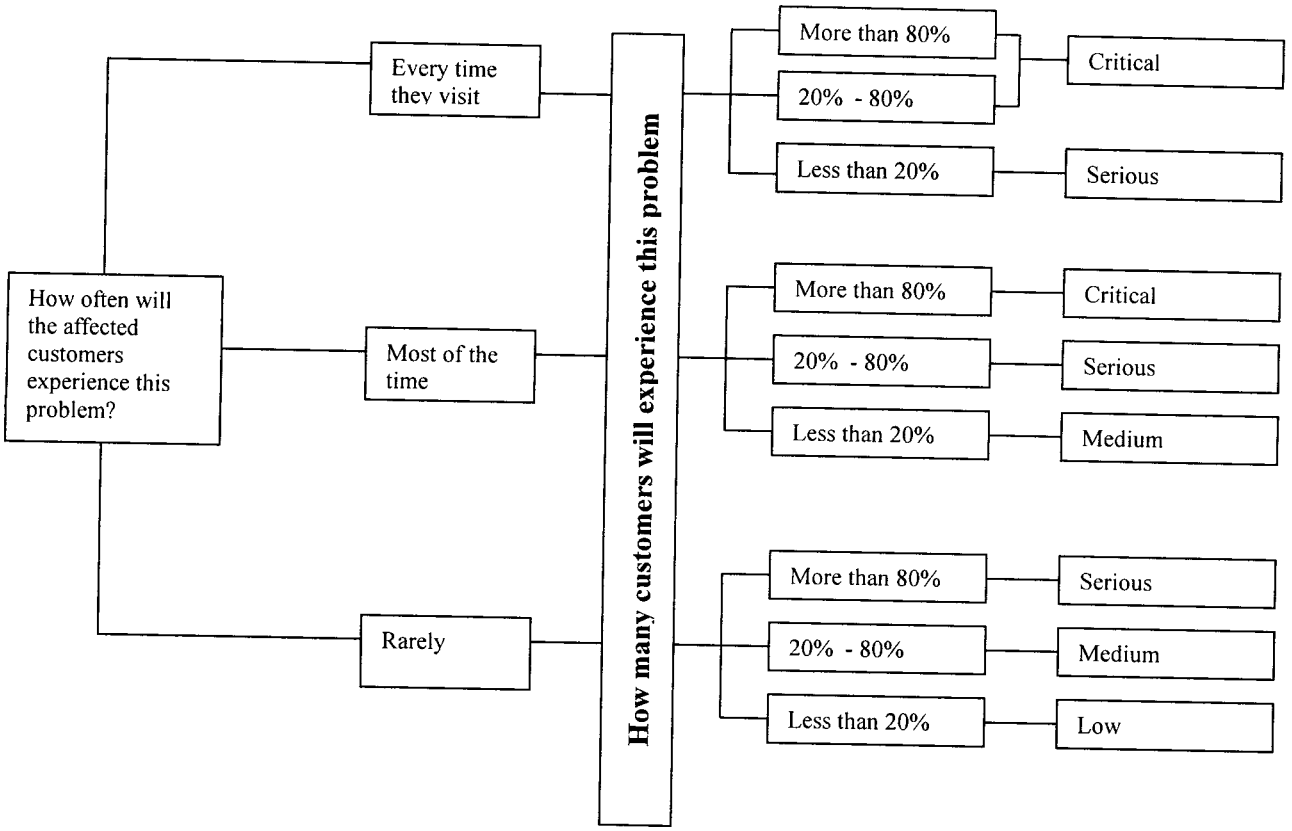

Figure 5.4: Flow chart for usability problems: High consequence

Chapter 6

CARMS Usability

Risk departments in Transwerk are mainly users of the CARMS program. As it has been already mentioned that Transwerk is part of Transnet, this research is limited to Transwerk. In this chapter we will clarify the reasons why CARMS needs to be tested and evaluated for usability.

The aims and objectives for the development and implementation of CARMS include:

- The optimization/reduction of the Cost of Risk for Transnet;
- The reduction/elimination of risk and losses;
- The provision of a set of tools for management of risk related issues such as incident management and claims administration, and
- To enable generation of suitable statistics for risk management and control purpose. These statistics are to be generated on an individual Business unit or a plant level, as well as that needed on the Corporate level.

To achieve all the above-mentioned aims and objectives, plants have to utilize all modules that are relevant to Risk Management. The information was collected to compare from the user, which modules are supposed to be used by whom in Risk Department in an ideal situation, against the actual doing. Then through the informal interview the Risk Managers and Risk Official were interviewed to find out what are the reasons of not utilizing the program fully.

6.1 Users of CARMS

The CARMS modules, which are supposed to be available and used by the Risk Management Team, are the following:

1. Injury On Duty (IOD) clerks are using the following modules:
- Incident management module
2. Risk officials are using the following modules:
- All excluding Cost of Risk and ESAP
3. Risk Managers are using the following modules:

- All modules

4. Plant Managers are using the following modules:

- Technilaw Auditing Program

5. Risk Cooperate Manager is using the following modules:

- All excluding incident management

6.2 Users of CARMS survey

The survey was done and sent to all members of Transwerk Risk Department in all seven plants. This survey was conducted through a questionnaire (see Appendix A), aiming to give information about the plants and to find out which modules are used or not used. The results of the survey (in Table 6.1) show that not all plants are using the supposed used modules of CARMS. There are certain modules that are not used at all. Other modules are utilized only in certain plants.

Table 6.1: The Plants versus CARMS modules

	Koedoespoort	Langlaagte	Germiston	Uitenhage	Bloemfontein	Saltriver	Durban
Safety Admin Annual Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Audit Program Register	No	No	No	No	No	No	No
NOSA Audit Program	No	No	No	No	No	No	No
OHS (Technilaw) Self Assessment	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Risk Program Audit	No	No	No	No	No	No	No
BCM	Yes	Yes	Yes	No	No	Yes	No
Cost Of Risk	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DIFR	Yes	Yes	Yes	Yes	No	No	No
ESAP	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fatality Register	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SHER Indecis	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incidents, Injuries & Losses	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Injury Classification for NOSA	Yes	Yes	No	No	No	No	No
Injuries - Search	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Major Loss Announcements	No	No	No	No	No	No	No
Systematic Casual Analysis (TSCAT)	Yes	No	No	No	No	No	No
NOSA Program Register	No	No	No	No	No	No	No
OHS Medical Surveillance	No	No	No	No	No	No	No
PPE Register	No	No	No	No	No	No	No
Waste Contracts Manager	Yes	Yes	No	No	No	No	No

6.3 Interview

The survey was done to all risk management staff where the checklist (Appendix A) was developed to identify who uses which module. The result of this survey in Table 6.1 shows that there are modules that are not used by other plants. The focus group interviews were conducted with the Risk Managers and Risk Officials, from different plants to find out why there is a gap between ideal and actual situations and also to find out why some plants use certain modules while others do not. The Risk Managers and Risk Officials, when responding to the question of why they do not use some of the modules in CARMS, gave the following responses:

1. Access problems

CARMS runs via the Internet, which is one of the limitations in plants where the management does not want to grant every Risk Official an access to Internet but expect work to be done. If they do grant Risk Officials Internet access, there are limitations on usage time. Management claims it is costly to log onto Internet for a long time, then employees are restricted.

2. Poor communication

If there are changes or upgrades in the program or in modules, there is no formal system of communication to notify all users about such changes.

3. Poor user friendliness

- Poor navigation, ambiguous or no indication of where you are in some of other modules and how you can proceed.
- Too much security such that each time one opens a particular module of the CARMS, one has to log in with a password (see Figure 6.1), and still has to use the same password to open other modules as well (see Figure 6.2).
- Error prevention, if you type words where you are supposed to use numbers, this program does not give you any error message.

4. Repetitions

In Incident management module you have to collect the data from the investigation team and fill the information on TSCAT form. The very same data is supposed to be filled in for the Incidents, Injuries & Losses modules.

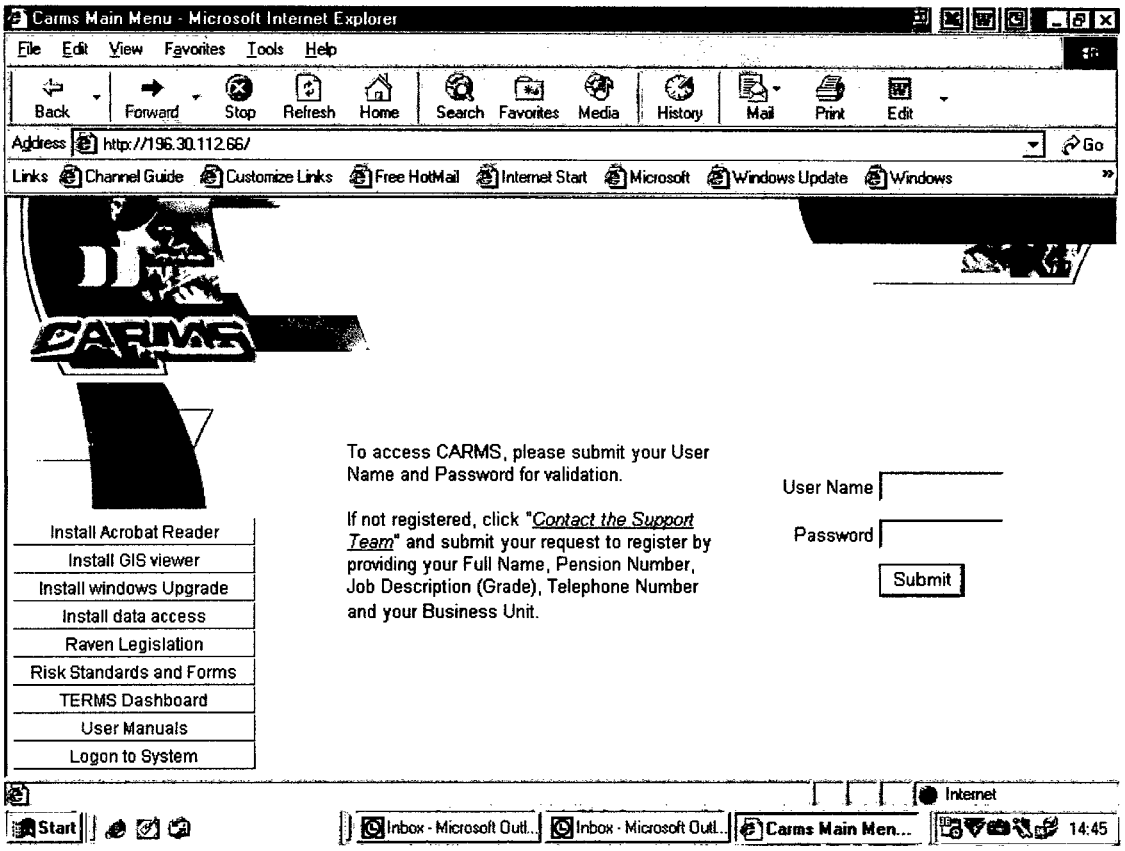

Figure 6.1 CARMS home page.

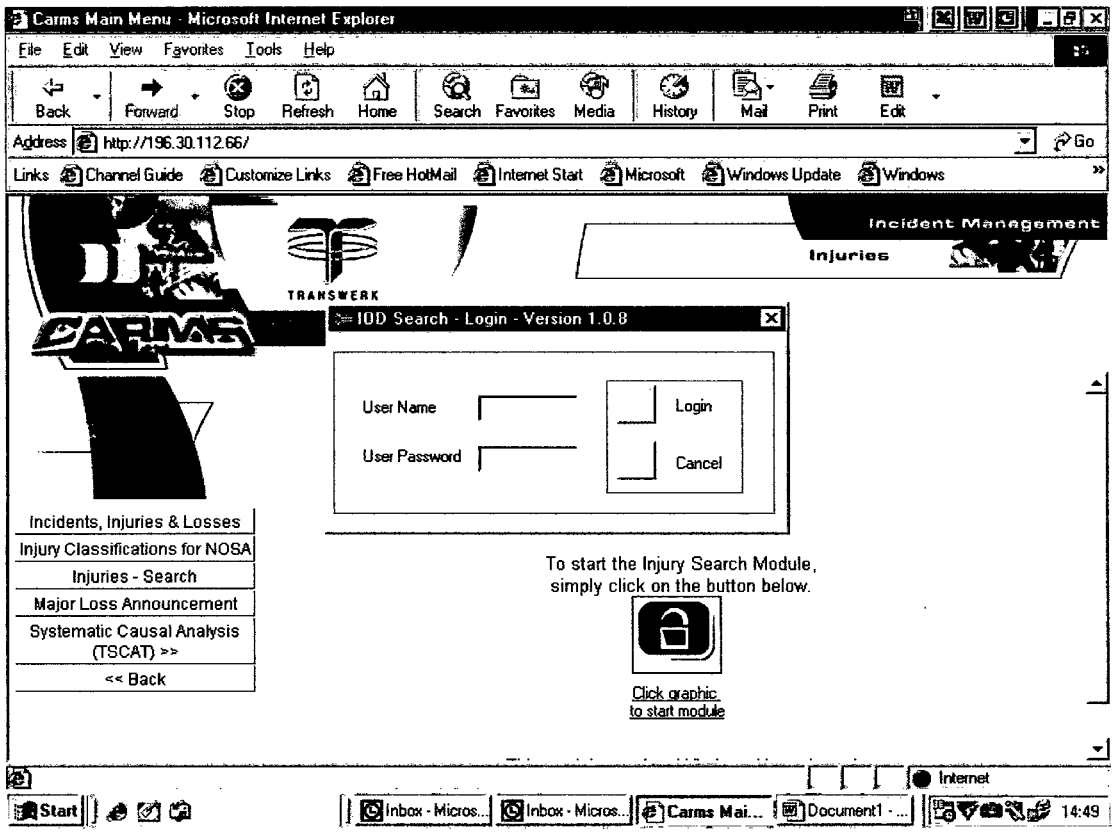

Figure 6.2 CARMS injuries – search page

5. Poor Design

The risk management programs like NOSA, during the audits, require trends of different events for which the data is there from modules but cannot be extracted by CARMS to produce graphs and trends. TSCAT does not cover environmental incidents for investigation.

To overcome these problems most of the plants have done the following:

- Replaced some modules with their own in-house programs. Instead of the TSCAT modules that are supposed to be used for incident investigation to find the causes (primary and secondary) of incident in order to prevent similar incident in future, plants use different investigation methods to replace TSCAT. This is explained in the following table:

Table 6.2: Table of plant and Investigation methods

Plant	Investigation Method
Koedoespoort	TSCAT
Langlaagte	SCAT Book
Germiston	SCAT Book
Uitenhage	Incident Management Program (In-house)
Bloemfontein	ANNEXURE 2 FORM
Saltriver	ANNEXURE 2 FORM
Durban	ANNEXURE 2 FORM

- Other modules are not used at all, just because they are a repetition of what other programs in place are already doing, like the NOSA program for instance.

This has already defeated the purpose of having one uniform program, where the Senior Management can monitor the progress of the plant. All these modules are important to the Cooperate Office and Transnet Risk Management for decision-making and to formulate the trends for the progress of the plants towards the Pure Risk management goals. To verify and correct these above-mentioned usability problems, thorough usability testing and evaluation has to be performed. In the next chapter we draw conclusions and make recommendations about the usability of CARMS at Transwerk.

Then the conclusion will be drawn based to the results from data analysis and recommendation will be sent to the Transwerk Co-operate office, Transnet Risk management Office and to the designers of the system (ReproRisk).

Chapter 7

Conclusion

Usability is no longer a nice-to-have function in the systems, because it is proven that all users are important and they need to be considered from the designing phases of the system. Therefore, companies like Transnet need to make sure that usability is included, where the users needs and their environment are taken into consideration during the early stages of design. By obtaining usability testing and evaluation findings and outcomes of the product concerned, the customer can be sure that usability is tested but this does not give 100% guarantee that the system is usable.

Even the systems that are running or in use at the present moment still need to be tested and evaluated for usability, for any defects that are identified can be rectified and those that need to wait for upgraded version can be identified.

In conclusion I recommend that all programs or systems that are used in Transnet (including the Business Division of Transnet like Transwerk) do usability testing and evaluation. This will improve usability and they will receive more accurate information from end users, and usability defects or problems will be identified and treated accordingly.

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Appendix A, CARMS Information flow checklist:

Question
1. Designation (e.g. Risk official, Production Manager or Clerk)
2. Do you have access to Intranet or Internet?
3. Do you have access in CARMS?
4. On what modules of CARMS were you trained?
5. Which modules of CARMS do you have access to?
6. Do you enter any information on CARMS?
7. If Yes what kind of information and on which modules? (only headings)
8. If NO what kind of information are retrieving and from which modules? (only headings)