Benchmarking educational web portals: An application of the Kano method

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Benchmarking educational web portals: An application of the Kano method

by
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Submitted in partial fulfilment of the requirements for the degree
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ANNEXURE D

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FACULTY OF EDUCATION

RESEARCH ETHICS COMMITTEE

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DEGREE AND PROJECT	M.Ed Computer Integrated Education Benchmarking educational web portals: An application of the Kano method
INVESTIGATOR(S)	Catherine Ann MacDonald - 24326586
DEPARTMENT	Curriculum Studies
DATE CONSIDERED	21 November 2006
DECISION OF THE COMMITTEE	APPROVED

This ethical clearance is valid for 2 years from the date of consideration and may be renewed upon application

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DATE	21 November 2006
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Declaration

I declare that...

Benchmarking educational web portals: An application of the Kano method

... is my own work, and that the sources that I have used or quoted have been included and acknowledged by means of complete references.

Catherine Ann MacDonald
29th August 2008

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Terminology List

Action Research: "...an on-the-spot procedure designed to deal with a concrete problem located in an immediate situation" (Cohen & Manion, 1994 in Bless & Higson-Smith, 2004).

Benchmark: "a standard or point of reference" (Allen, 1991).

Benchmarking: The process of testing or determining whether or not a product meets a benchmark or "a particular point of reference" (Allen, 1991).

Benchmark specifications: **"**... what the system, process, or product/ service must do in order to fulfil the business requirements" (Allen, 1991).

Design research: **"**Knowledge is generated and accumulated through action. Doing something and judging the results is the general model... the process is shown as a cycle in which knowledge is used to create works, and works are evaluated to build knowledge" (AIS, 2007).

Educational web portal: "A portal acts as a gateway which provides entry to..." educational materials or sites "...on the World Wide Web (WWW)" (Yang et al, 2005).

Kano method: Noriaki Kano, a professor from the University of Tokyo, developed a model to understand users' perception of quality (Berger et al, 1999).

Portals: "A portal acts as a gateway which provides entry to specific sites on the World Wide Web (WWW) (Yang et al, 2005).

Abstract

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Degree: MEd Computer Integrated Education

Title: **Benchmarking educational web portals: An application of the Kano method**

The Kano method[1] was used in order to determine the benchmark requirements of an educational web portal. A comprehensive list of possible specifications for an educational portal was constructed by examining the characteristics of educational portals globally. This information was used to develop a questionnaire in accordance with the Kano method. A number of hand-picked expert users were asked to answer the questionnaire. The results obtained from these questionnaires were used to categorize the importance of each component of a web portal as a "one-dimensional"[2], "must-be"[3] or "attractive"[4] requirement. The components categorized as "must-be" requirements were used to generate the benchmark of the minimum specifications of an educational web portal.

Keywords:

1. Educational web portals
2. Portals
3. Kano method
4. Noriaki Kano
5. Customer requirements
6. One-dimensional requirements
7. Must-be requirements
8. Attractive requirements
9. Perception of quality
10. Benchmark specifications

[1] Noriaki Kano, a professor at the University of Tokyo, developed a model to understand users' perception of quality. See Chapter 3: Research Methodology, Page 21.
[2] See Chapter 3: Research Methodology, Page 21.
[3] See Chapter 3: Research Methodology, Page 21.
[4] See Chapter 3: Research Methodology, Page 21.

Chapter 1: Introduction

Contents

1.1 Introduction

Chapter 1 is an introduction to the research study and gives a short description of the aim and purpose of the research. It contains, as well, a rationale for the research, and a summary of the methodology used. The limitations experienced during the research process are set out, and, finally, an overview of the research report structure is given.

1.2 Aim and purpose of the research

The aim of the research was to determine the benchmark specifications[5] of an educational web portal. Points investigated included the following:

- What are the benchmark specifications of an educational web portal that affect specialist users' perception of quality?
- What minimum benchmark specifications do specialist users expect of an educational web portal?[6]

The research findings are essential to creating a benchmark for the minimum specifications of an educational web portal expected by specialist users.

1.3 Rationale

The importance of this research is highlighted by drawing attention to the fact that the data for benchmark specifications of educational portals was previously not available. The results of the research have provided a set of guidelines which can be utilized by portal developers, in order to ensure that new portals meet all of the requirements of specialist users. The results of the research also provide the basis for further research in order to ascertain the quality of web portals, including Thutong,[7] and to establish whether or not the portals are addressing the needs and system requirements of their target audiences.

[5] See Chapter 3: Research Methodology, Page 21.
[6] See Chapter 3: Research Methodology, Page 21.
[7] The South African National Education Portal.

1.4 Methodology

The following is a brief synopsis of the research methodology used in this study. A comprehensive description may be found in Chapter 3: Research Methodology.

The Kano method[8] was used in order to determine the benchmark requirements of an educational web portal. A comprehensive list of possible specifications for an educational portal was constructed by examining the characteristics of educational portals globally. This information was used to develop a questionnaire in accordance with the Kano method. A number of hand-picked expert users were asked to answer the questionnaire. The results obtained from these questionnaires were used to categorize the importance of each component of a web portal as a "one-dimensional"[9], "must-be"[10] or "attractive"[11] requirement. The components categorized as "must-be" requirements were used to generate the benchmark of the minimum specifications of an educational web portal.

As the Kano method is a quantitative research process, the following research techniques were used:

- Quantitative questionnaires. The questions were formulated so as to address the research questions outlined above.
- Quantitative analysis of the data collected.

1.5 Limitations of the research

A limitation of the research was the small number of individuals who participated in the study. In order to raise the level of participation it is recommended that an incentive be offered to research participants. The number of individuals approached to participate in the research could also be increased.

[8] Noriaki Kano, a professor at the University of Tokyo, developed a model to understand users' perception of quality. See Chapter 3: Research Methodology, Page 21.
[9] See Chapter 3: Research Methodology, Page 21.
[10] See Chapter 3: Research Methodology, Page 21.
[11] See Chapter 3: Research Methodology, Page 21.

Participants became frustrated when answering the online questionnaire. The online questionnaire did not save the participants responses periodically, if connectivity was disrupted or lost, which caused the participants to lose all the answers captured before the disruption occurred. The inclusion of a mechanism which saves participants' answers periodically, perhaps every minute, would overcome this problem.

One participant became irritated by the tedious nature (having to answer the functional and dysfunctional form of each question for 128 questions) of the questionnaire, and decided not to complete it. Perhaps this problem could be eliminated by reducing the number of questions.

1.6 Report structure

An overview of the structure of the report is provided in Table 1.1.

Table 1.1: Report structure

Chapter	Title	Description
1	Introduction	Chapter 1 gives a brief synopsis of the research study.
2	Literature review	Chapter 2 provides a review of literature pertaining to portals.
3	Research methodology	Chapter 3 gives an overview of research and documents the process followed in order to ensure that this study complied with the highest standards.
4	Data collection and analysis	Chapter 4 describes the data collection, data processing and data analysis processes.
5	Summary, conclusions and recommendations	Chapter 5 sets out the overall conclusions drawn from the research study as well as recommendations for both researchers and web portal designers.

Chapter 2: Literature Review

Contents

2.1 Introduction

This chapter gives a review of the literature pertaining to portals, with particular emphasis on the process of information management. The various definitions of a portal, offered in the literature, are included.

The literature review provides an indication of the way in which portal functionality has developed over the years and covers information about the various types of portals, namely information portals, and business, corporate and enterprise information portals. The nature of public portals compared to other portals is explored and the content accessibility guidelines developed by Yang, Cai, Zhou and Zhou (2005) are reviewed. The recommendations for web portal design created by Yang, Cai, Zhou and Zhou (2005) are compared to the recommendations for mobile portal design devised by the Nokia Corporation (2005).

2.2 Information management

Dias (2001 citing Horton, 1986) highlights the fact that information management has undergone a number of changes and evolved through various stages of development and that, "until the 1980s, information management has passed seven different stages". He notes that the initial stages (one and two) of information management involved the management of structures which contained information. According to him, primary attempts to handle the numerous structures which contained information were only made in the early 1900s:

> *In the first period, the concern was the physical control of information containers that, after the turn of the century, tended to mechanization, simplification, and replication of these containers, originating the first efforts to control the proliferation of information containers, essentially on paper* (Dias, 2001).

Dias (2001) believes that the third stage of information management involved handling the structures which contained information in a more ordered manner, pointing out that "[i]n

the 1920s and 1930s, the third stage came with records management, focusing on information containers management in a more organized and wider perspective". The fourth stage began "with the advent of the computer … represented by the management of automated information technologies".

Dias (2001) goes on to explain that stage five of information management was introduced as a result of the dissemination of information and the widespread use of information technology This phase, he says, "was characterized by information explosion and use of computers and other technologies such as microfilms, microfiches, and optical devices".

The sixth stage of information management started at the end of the 1960s (Dias, 2001) with the development of information management systems. With regard to the seventh stage, Dias (2001) cites Chen (1998), as follows:

> *In the 1970's, information management started to be called information resources management, a new strategy for managing all necessary information in an enterprise. Most of the modern companies are experiencing this seventh stage of information management, although a new concept has already appeared recently, knowledge management, the eighth stage of information management.*

Information management has clearly undergone a number of changes and has evolved through various stages of development. The most significant of these changes relates to the dissemination of information through the use of computers and information technology.

2.3 Web portals

2.3.1 Definition of a web portal

According to Katz (2002), the 2002 edition of the Winston Dictionary defines a portal as a "gate, door, or entrance; especially one that is stately and imposing, as of a cathedral".

In his analysis of this definition, Katz (2002) notes that a portal in the context of the web is more than a gateway: "the portal is an 'organizing principle' or metaphor for how institutions will organize themselves and their services in cyberspace".

A definition similar to that offered by the Winston Dictionary is proposed by Clarke and Flaherty (2003), who point out that the word "portal" is "derived from the Latin porta, or gate, through which something will pass in an effort to get to another place". Clarke and Flaherty go on to define web portals as "[a]ny site that serves as an entry point to other content on the Internet" and "the gateways through which business clients enter the web to connect to desired Internet locations".

Likewise, Gappa and Nordbrock (2004) associate the term "portal" with a gateway and an entry or starting point to visiting specific locations on the worldwide web (WWW) when they say: "Internet portals are gateways to the World Wide Web utilized by users as a starting point in their browsing activities or as an anchor site."

Yang et al (2005) offer the following description of the characteristics of portals:

> *An information presenting Web portal (IP Web portal) is a site that provides users with online information and information-related services, such as search functions, community building features, commerce offerings, personal productivity applications, and a channel of communication with the site owner and peer users.*

It is clear from the definitions of a portal offered above that the descriptions can be classified into two categories – those that focus on the metaphor of a portal as a gate or gateway and those that focus on the purpose of the portal. The majority of the definitions listed focus on the metaphor of the portal as gate or gateway. Ideally, the definition of a portal should reflect both elements of the two categories, as in the following definition given by Yang et al (2005): "A portal acts as a gateway which provides entry to specific sites on the WWW" and facilitates access to "online information and information-related services."

2.3.2 Functionality of web portals

Table 2.1 demonstrates the functionality of educational web portals listed by various authors since 2001.

Table 2.1: Functionality of educational web portals

Author	Date	Description
Dias	2001	"Three or four years ago, what is now called a portal was referred to as a search engine, whose main goal was to facilitate access to information contained in documents spread throughout the Internet. Initially, search engines enabled Internet users to locate documents with the use of Boolean operators or associative links between web pages".
Kim, Chaudhury, and Raghav Rao	2002	"Portals in general provide three types of features: search, transactional function, and communications" (citing O'Leary, 1999). "Personalization has recently become an essential feature in portals. It allows particular segments of the users to specialize in focused topics of interest" (citing Kuchinskas, 1999).
Katz	2002	"A portal is a fundamental departure from the old entity-centric web experience. Portals represent a basic change in the way we present web information to users and in which users use the web" (citing Strauss, 2000).
Clarke and Flaherty	2003	"Portals feature customizable architecture that allows users to integrate data from disparate sources". "… provide seamless access to a variety of goods and services via a single interface based on a predefined profile of preferences".

Table 2.1: Functionality of educational web portals (continued)

Author	Date	Description
Yang et al	2005	"Portals offer an amalgamation of services such as search engines, online shopping, e-mail, news, weather reports, stock quotes, community forums, maps, travel information, employment, etc. Some of them are starting to offer some content customisation facilities as well". "During the past decade, an increasing number of organizations have established IP Web portals to complement, substitute for, or extend their existing services to users". "… by integrating an IP Web portal with existing business processes, portal owners hope to create a cost effective channel to communicate with users, e.g., potential and existing customers, as well as other stakeholders".

The literature provides an indication of the way in which portal functionality has developed over the years. However, there seems to be some disagreement with regard to the exact year in which customization and personalization came to be a prevalent feature in portal design. Kim et al (2002) note that "personalization" had become a critical feature in portal functionality by 1999. Clarke and Flaherty (2003), on the other hand, state that portals had begun to feature customizable architecture in 2003. Yang et al (2005) highlight the fact that a vast number of businesses had begun making use of portals as a tool to enhance their business practises and state that in 2005 some of them were starting to "offer some content customisation facilities".

2.4 Web portal types

2.4.1 Information portals

Dias (2001) refers to the following observations by Murray (1999, in Dias 2001) and White (1999, in Dias 2001) as providing a basis for a definition of an information or content portal:

> *Murray (1999 in Dias, 2001) states that the information portal is the one able just to organize large collections of content based on the subjects they contain, connecting people with information*.
>
> *White (1999 in Dias, 2001) calls this basic form of portal an "Intranet portal", which includes links to information and web sites within and outside the company*.

If these observations are combined, a good definition of an information portal might be as follows:

An information portal is a portal which can "organize large collections of content based on the subjects they contain" (Murray, 1999 in Dias, 2001) and which provides "links to information and websites within and outside the company" (White, 1999 in Dias, 2001) in order to facilitate access to information required.

2.4.2 Corporate, business and enterprise information portals

The terms "corporate portal", "business portal" and "enterprise information portal" (EIP) seem to be used interchangeably to describe a portal which is used to share information, content and tools within an organization, corporate or business environment.

Dias (2001) carried out a review of various definitions of corporate portals, business portals and EIPs, and highlights the following:

> *Reynolds and Koulopoulos (1999 in Dias, 2001) view the corporate portal as a user-*

centric information system, able to integrate and deliver knowledge and experiences of individuals and teams, in order to achieve the ''knowledge-centric'' patterns of today's work world (Reynolds & Koulopoulos, 1999 in Dias, 2001).

Eckerson (1999, in Dias, 2001), on the other hand, uses another term ''business portal" and defines it as an application able to provide business users with one-stop shopping for any information they need inside or outside the enterprise (Eckerson, 1999 in Dias, 2001).

Murray (1999, in Dias, 2001) states that portals that focus only on content are inadequate for the corporate market and that ''corporate portals must connect us not only with everything we need, but with everyone we need, and provide all the tools we need to work (Murray, 1999 in Dias, 2001).

Plumtree Software (2000, in Dias 2001), from another standpoint, defines its corporate portal as a system which is able to bring together in one simple, personalized web page, all the information and productivity tools relevant to corporate users, hosting dynamic applications, such as online reports, e-mail, schedules, calendars, and business services (Plumtree Software, 2000 in Dias, 2001).

Enterprise information portals are applications that enable companies to unlock internally and externally stored information, and provide users a single gateway to personalized information needed to make informed business decisions (Shilakes & Tylman, 1998 in Dias, 2001).

White (1999, in Dias, 2001) views the EIP as a tool that provides business users with a single web interface to corporate information scattered throughout the enterprise (White, 1999 in Dias, 2001).

Applications that enable companies to provide access to internally and externally stored information, and offer users within and external to the enterprise a single window to personalized information needed to make informed business decisions (Viador, 1999, in Dias, 2001).

> *Enterprise Information Portals (EIP) are gateways that streamline access to information, thereby easing the task of transforming data into knowledge and helping in efficient knowledge management* (Millman, 1999, in Dias, 2001).

It is apparent from the above definitions of corporate portals, business portals and EIPs that there are some minor disparities. The definitions provided by Shilakes and Tylman (1998, in Dias, 2001), Reynolds and Koulopoulos (1999, in Dias, 2001), Eckerson (1999, in Dias, 2001), White (1999, in Dias, 2001) and Millman (1999, in Dias, 2001) are all centred on the provision of access to all the information and knowledge needed in the world of work. By contrast, Murray (1999, in Dias, 2001) considers the corporate portal to be more than a point of access to commercial information and notes how important it is that such portals should be able to provide the essential tools required to work effectively. The definition offered by Viador (1999, in Dias, 2001) appears to place greater emphasis on the personalization of the information in order to aid the decision-making process within the business environment. Plumtree Software (2000, in Dias, 2001) seems to merge many of the characteristics mentioned in the other definitions, stating that a corporate portal must be able to not only provide necessary information and tools but also support collaborative decision processing.

2.4.2.1 Types of corporate, business and enterprise information portals

Research carried out by Dias (2001) revealed two types of corporate, business and enterprise information portals, which he classifies as “decision processing” and “collaborative processing” portals. (For ease of reading, these portals are collectively referred to as EIPs from here onwards in this text.)

According to Dias (2001**)** the main focus of a collaborative EIP is to facilitate access to “groupware tools and workflow systems” in order to make available relevant information, created by groups of individuals. In this regard, he states:

> *This type of portal uses collaborative groupware tools and workflow systems to provide access to information produced by individuals or workgroups. The information managed*

> *by this type of portal is generally unstructured, customized and displayed as texts, memos, graphs, e-mail messages, news bulletins, web pages, and multimedia files* (Dias, 2001).

The main focus of the decision processing EIP is to facilitate access to specific information essential for constructing decisions pertaining to business issues:

> *[T]he decision processing EIP helps executives, managers and analysts access the necessary information for making business-oriented decisions, while the collaborative processing EIP organizes and shares workgroup information, such as e-mail, reports, and memos* (Dias, 2001).

Roberts-Witt (1999, in Kim et al, 2002), however, believes that there are three types of EIPs, namely data, information and collaborative portals.

Clearly, therefore, there are different types of EIP. Both Dias (2001) and Roberts-Witt (1999, in Kim et al, 2002) believe that one type of EIP is the collaborative. Combining the classifications of these authors, it may be concluded that there are four types of EIP: collaborative, decision processing, data and information. The existence of these different types of EIP could be the reason for the slight disparities between the definitions offered earlier.

2.4.3 Public portals

The purpose of a public portal, according to Dias (2001) is to draw as many visitors as possible from throughout the WWW. He elaborates on this as follows:

> *The public portal, also called Internet portal, web portal or consumer portal, provides a single interface to the immense network of Internet servers. Its purpose is to attract the Internet community. The larger the number of visitors, the greater the probability of establishing virtual consumer groups that will potentially buy what portal advertisers want to sell* (Dias, 2001).

Similarly, Clarke and Flaherty (2003) believe a public portal should be accessible to

everyone navigating the WWW and state that there are no limitations of use: "A public portal is available to anyone on the Internet and there are no restrictions for access".

It seems, therefore that public portals are accessible to all Internet users whereas EIPs are only accessible to specific individuals who work within a particular business or corporate environment.

2.5 Web portal design

Davenport and Prusack (1998, in Kim et al, 2002) emphasize the importance of considering "behavioural, cultural and organizational issues" in knowledge management and thus web portal design. They maintain that "[t]echnology alone cannot bring effective knowledge management without taking into account extensive behavioural, cultural, and organizational issues" (Davenport & Prusak, 1998, in Kim et al, 2002).

2.5.1 Web content accessibility guidelines

The ease of access to web content is raised as a pertinent issue by Yang et al (2005), who were responsible for developing a number of web content accessibility guidelines. The first of these guidelines focuses on the way in which information or content has been presented on the portal:

> *Guideline 1: Perceivable. The perception of information presented as text is problematic for the studied user groups. In particular, small font sizes and cluttered layouts pose big problems* (Yang et al, 2005).

The next guideline notes the importance of the way in which users operate or make use of the portal:

> *Guideline 2: Operable. Users participating in the study expressed strong opinions against blinking and flickering ads, which they found annoying and distracting. We must also*

> *highlight the fact that older persons and people with physical disabilities often prefer to use the mouse or a mouse emulation system, even if it is more difficult for them to access active elements than via the key board* (Yang et al, 2005).

Navigation is highlighted as one of the most significant components of accessible portal design. The importance of including both a sitemap and a search function in order to help users find their way through the portal is also acknowledged:

> *Guideline 3: Navigable. This is probably the most critical issue in regard to Internet portals. Users have difficulties in finding information more than two layers deep. Our study has shown that the alternative method most used by test participants is the search function. In our opinion, the minimum default alternative navigation method (success criteria at the minimum level) should include both the search function and the sitemap* (Yang et al, 2005).

Yang et al's (2005) fourth content accessibility guideline emphasizes the value of including a glossary as well as a list of frequently asked questions (FAQs) as mechanisms to increase users' understanding:

> *Guideline 4: Understandable. This is also a critical issue for the test participants … In our opinion, the minimum success criteria shall be linked to the existence of a glossary and a set of frequently asked questions (FAQs). It is important to highlight also that users explicitly quantified the length of paragraphs that can bring up understandability problems* (Yang et al, 2005).

According to Yang et al (2005) the accessibility of content contained in a web portal depends on how "perceivable", "operable", "navigable" and "understandable" it is.

2.5.2 Recommendations for portal design

Clarke and Flaherty (2003) construct the following approach to devise an effectual portal strategy: "The 'Five D's' of portal strategy are proposed: (1) define, (2) design, (3) develop, (4) deliver, and (5) defend. The 'Five D's' offer a general blueprint for the creation of an effective portal strategy".

A review of the recommendations provided for portal design reveal the approach suggested by Clarke and Flaherty (2003) to be very different to the recommendations made by Yang et al (2005). Yang et al focus more closely on the design of the structure of the portal rather than is the case with the strategy for developing the portal put forward by Clarke and Flaherty.

Yang et al (2005) make a number of suggestions pertaining to the design of portals. The first of these relates to layout, and in this regard they point out that "Internet portals offer a vast amount of information. There is a need to limit the amount of information on a Web page". They note, further, that "[w]hen designing the layout of an Internet portal, it needs to be initially considered that visitors have certain questions in mind, to which they are seeking an answer".

With regard to navigation, Yang et al (2005) believe that links to other websites should be obviously recognizable:

> *When linking to another Web site, as it happens frequently in Internet portals, designers often decide to highlight this fact by opening a new window in the browser. This is rather confusing for users. Therefore, external links must be clearly identified as such via some visual cues (e.g., a small icon) and contain an adequate title attribute*.

According to Yang et al (2005) there are clear guidelines which should be taken into consideration when creating a search facility of a portal:

> *[O]ffering always a very visible in-site search facility, with the input field at the top of the page, near the navigation bar*.
>
> *The search engine should carefully reflect the content and functionality of the portal. It shall also accommodate weak writing skills, neglect typing and spelling mistakes, and recognize conjugated verbs and declined nouns*.

> *The search engine must be able to suggest alternative keywords according to the users' histories of search queries*.

Yang et al (2005) also put forward a number of suggestions about the content contained on the portal:

> *Emphasize keywords (with visual or oral cues); otherwise the user will quickly leave the portal and become a lost customer*.

> *To enable the scanning of a Web page, it is very important to provide headers and summaries, so the user can decide quickly whether it is worth to read further*.

> *Also sentences formulated in active rather than passive voice are easier to understand.*

In order to accommodate all the recommendations provided by Yang et al (2005) a portal designer should be conscious of the layout, navigation, search facility and content contained on the portal.

2.5.3 Recommendations for mobile portal design

The recommendations for mobile portal design offered by the Nokia Corporation (2005) are very different to those provided by Yang et al (2005) regarding the design of web portals. The Nokia Corporation believes that the use of different page names throughout a mobile portal may help users locate their whereabouts and aid navigability:

> *Very often the page title is same throughout the portal. Sometimes the main page has portal name and the rest of the pages have subsection names. This does not help user to navigate and to know where he is in the portal* (Nokia Corporation, 2005).

Each time content is downloaded from a mobile portal, the procedure followed should be identical. The Nokia Corporation (2005) maintains that "[p]roviding same steps and

structure in all download processes would help user to learn the process and know beforehand what to expect". They also highlight the importance of making more detailed information about a particular product available on a mobile portal: "Typically the information is only a small icon of the game, the name and one word genre description. User should also be provided with sufficient information to make the purchase decision".

Finally, the Nokia Corporation (2005) emphasizes that mobile portals should be suitable for use by all phones and browsers: "If the portal is designed to be used well with all phones and browsers, user should always be able to navigate forward with hyperlinks".

The literature reviewed indicates that, like web portal designers, mobile portal designers should consider the layout, navigation and content contained on the portal. However, rather than focusing on the search facility, mobile portal designers should be aware of the technical aspects of the site and ensure that these are compatible with all phones, and that the site can be used by all browsers.

2.6 Summary

The literature reviewed demonstrated that information management has undergone a number of changes and has evolved through various stages of development. The most significant of these changes relates to the dissemination of information through the use of computers and information technology. An examination of the definitions of a portal offered in the literature showed that a portal acts as a gateway which provides entry to specific sites on the WWW and facilitates access to "online information and information-related services" (Yang et al 2005). The literature indicates how portal functionality has developed over the years and discusses the various types of portals, namely information portals, and business, corporate and enterprise information portals. The chapter also gives an account of the nature of public portals compared to other portals, as explored in the literature.

A review of the content accessibility guidelines developed by Yang et al (2005) is provided, and the recommendations for web portal design made by Yang et al (2005) are compared to the recommendations for mobile portal design devised by the Nokia Corporation (2005). The literature reviewed indicates that mobile portal designers, like web portal designers, should consider the layout, navigation and content contained on the portal. However, rather than focusing on the search facility mobile portal designers should be aware of the technical aspects of the site and should ensure that it is compatible with all phones and can be used by all browsers.

Chapter 3: Research Methodology

Contents

List of Addenda

(Addenda are available on the CD-Rom Attached)

Addendum A - Research Process Email

Addendum B - Consent Form

Addendum C - Kano Questionnaire

Addendum D - Data Collected

3.1 Introduction

In order to identify the context for this research study, Chapter 3 provides an overview of research by defining what is meant by the term "research". The position of design research is explained by means of a graphical representation which demonstrates how design research fits into research as a whole. In order to further clarify what is meant by design research, a concrete example of a potential outcome is included. The research paradigm of the study is indicated by explaining the characteristics of the research study. The chapter concludes by documenting the process which was followed in order to ensure that the research was carried out to the highest standards.

3.2 Research

According to the Concise Oxford Dictionary, "research" can be defined as an "endeavour to discover new or collate old facts by the scientific study of a subject or by a course of critical investigation" (Allen, 1991). The same source defines "research and development" as "[w]ork directed towards the innovation, introduction and improvement of products and processes".

The Association for Information Systems (AIS, 2007) provides this definition of research, which is based on the theories of Kuhn (1962, in AIS, 2007) and Lakatos (1978, in AIS, 2007): "Research can be very generally defined as an activity that contributes to the understanding of a phenomenon. In the case of design research, all or part of the phenomenon may be created as opposed to naturally occurring" (AIS, 2007). According to Bereiter (2002), design research is "research that produces innovations and sustains their development".

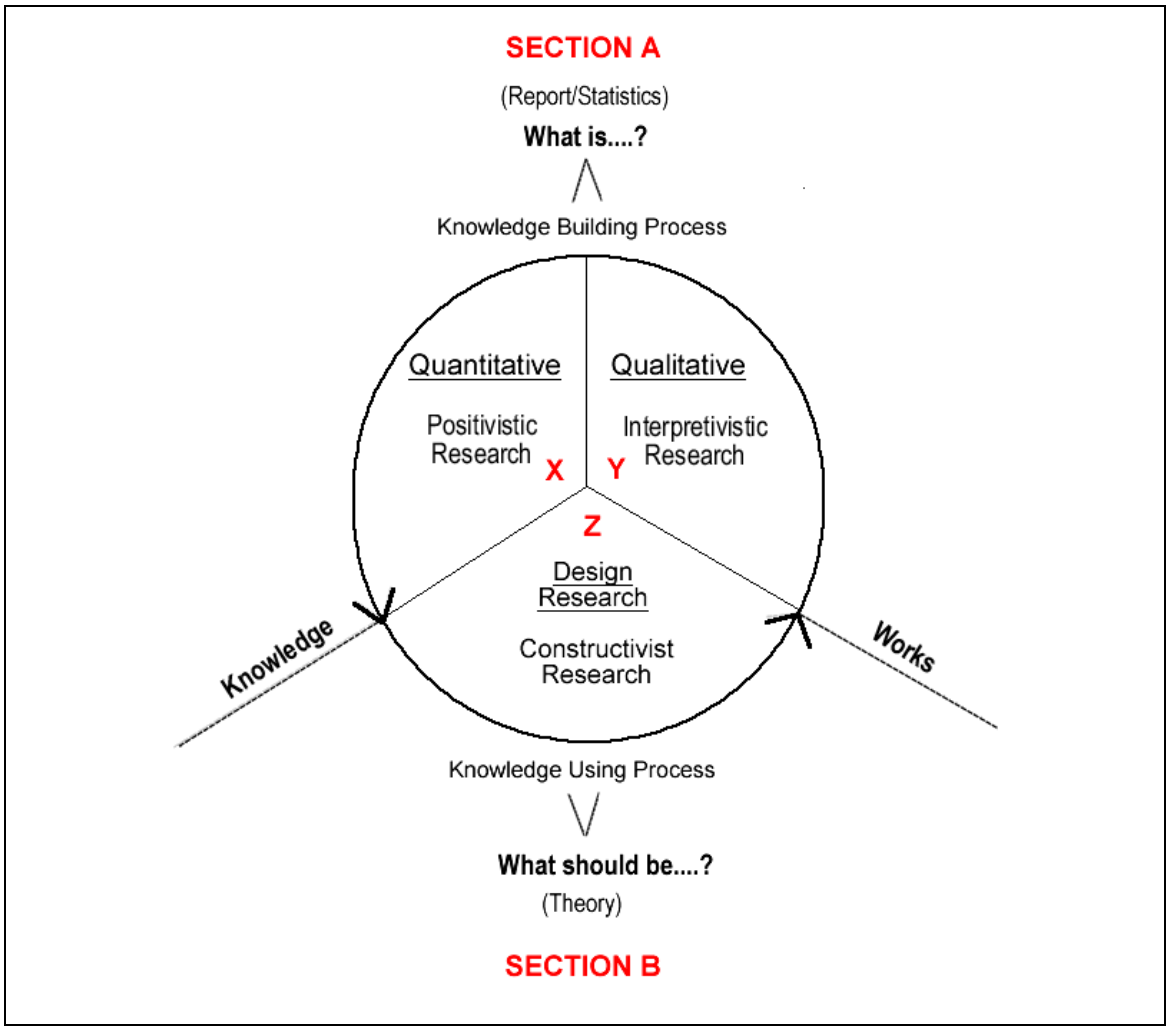
Taking these definitions into consideration, design research can be defined as an endeavour that contributes to the understanding of a created phenomenon, developed by a designer, with the aim of achieving sustainable development.

AIS (2007) notes:

> *Knowledge is generated and accumulated through action. Doing something and judging the results is the general model ... the process is shown as a cycle in which knowledge is used to create works, and works are evaluated to build knowledge.*

Figure 3.1 is helpful in clarifying the principles of design research as it provides a graphical representation of research as a whole.

Figure 3.1: Research process



Source: Adapted from Owen, 1997 (in AIS, 2007)

Section A of Figure 3.1 demonstrates how research can be used to build knowledge. This type of research process is often used to answer the question, “What is?”. The process involves the examination of a naturally occurring phenomenon in order to develop knowledge. An example of an output for this type of research would be a report containing detailed statistics. Both qualitative and quantitative research processes can take place through this type of knowledge building process.

Section A, point Y demonstrates the fact that interpretive research processes make use of works in order to create knowledge. In the world of social sciences, interpretive research methods focus on providing an interpretation of events and phenomena in terms of how the individuals involved perceive and understand their own experience (AIS, 2007). An example would be an enquiry into individuals’ perception of the quality of a specific product.

Section A, point X demonstrates that positivistic research processes also make use of works to create knowledge. The philosophy of positivism states that actual knowledge or truth is based only on real experience. Positivists believe that truth can only be arrived at through proving theories by means of strict scientific methods (AIS, 2007). An example of this would be an experiment carried out to prove the mathematical expression $E=mc^2$.

Section B of Figure 3.1 is a graphical representation of design research, illustrating the way in which an individual can evaluate knowledge in order to devise a theory on the design research process. An example of output for this type of research would be a theory or a model. Constructivists maintain that scientific knowledge is constructed and not discovered (AIS, 2007). The design research process often attempts to answer the question, “What should be?”.

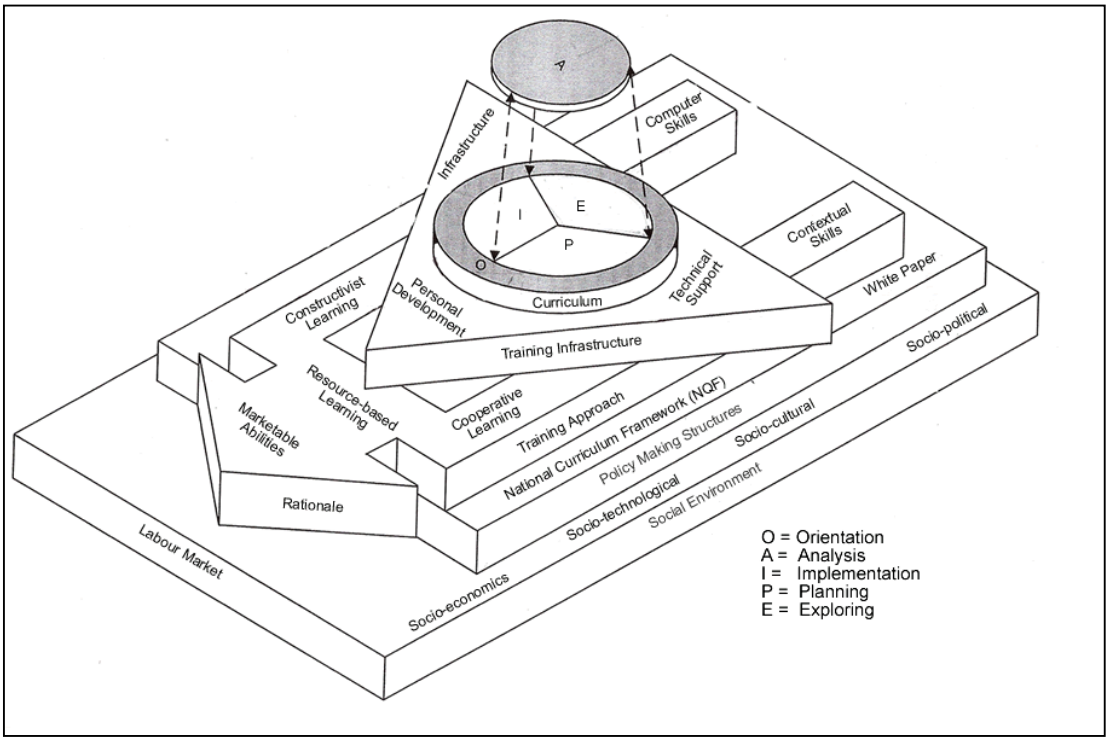
Blignaut (1997) conducted an investigation with the purpose of designing an instructional model for a Home Economics lecturer. A brief description of this investigation is given here to illustrate the approach and outcomes of the design research process. It was intended that the instructional model would enable the lecturer to design activities for his or her students to develop their competency in the use of computers and research. According to Blignaut,

competencies in the use of computers and research "underlie appropriate career related and marketable abilities to benefit a changing socio-technological culture within the framework of a changing democratising South Africa". She elaborates further as follows:

> *By means of action research procedure, these ideas were refined during a preliminary study into a prospective instructional model in which it is suggested that computer and contextual skills should be developed in an integrated way in order to empower the individual with career related marketable abilities* (Blignaut, 1997).

In an attempt to develop and make improvements to the instructional practice, the proposed model was implemented by means of an action research process and tested on a group of students. The outcomes of the research project were evaluated and finally an instructional model was constructed. Such an instructional model is a typical outcome of a design research process as it can be replicated and used in a multitude of subject areas. The framework could, for example, be followed by a music teacher who wishes to develop her or his students' competency in the use of computers as well as their ability to conduct research. Figure 3.2 gives a graphical representation of the instructional model developed.

Figure 3.2: Example of an outcome of the design research process



Source: Blignaut, 1997

3.3 The research paradigm of this study

The research paradigm of this study fits into section A, point X and Y of Figure 3.1, for the following reasons:

- The Kano method[12] is used in order to determine the minimum benchmark specifications[13] of an educational web portal expected[14] by specialist users.
- The Kano method makes use of both qualitative and quantitative research techniques, for example:
  - Quantitative questionnaires
  - Qualitative analysis of the data collected
- This research provides an interpretation of events and phenomena in terms of how individuals perceive and understand their own experience.

Therefore it can be said that the study makes use of works in order to create knowledge.

3.4 The research aim and process

3.4.1 Research aim

The aim of the research was to determine the benchmark specifications of an educational web portal. Points investigated included the following:

- What are the benchmark specifications of an educational web portal that affect specialist users' perception of quality?
- What are the minimum benchmark specifications of an educational web portal expected by specialist users?

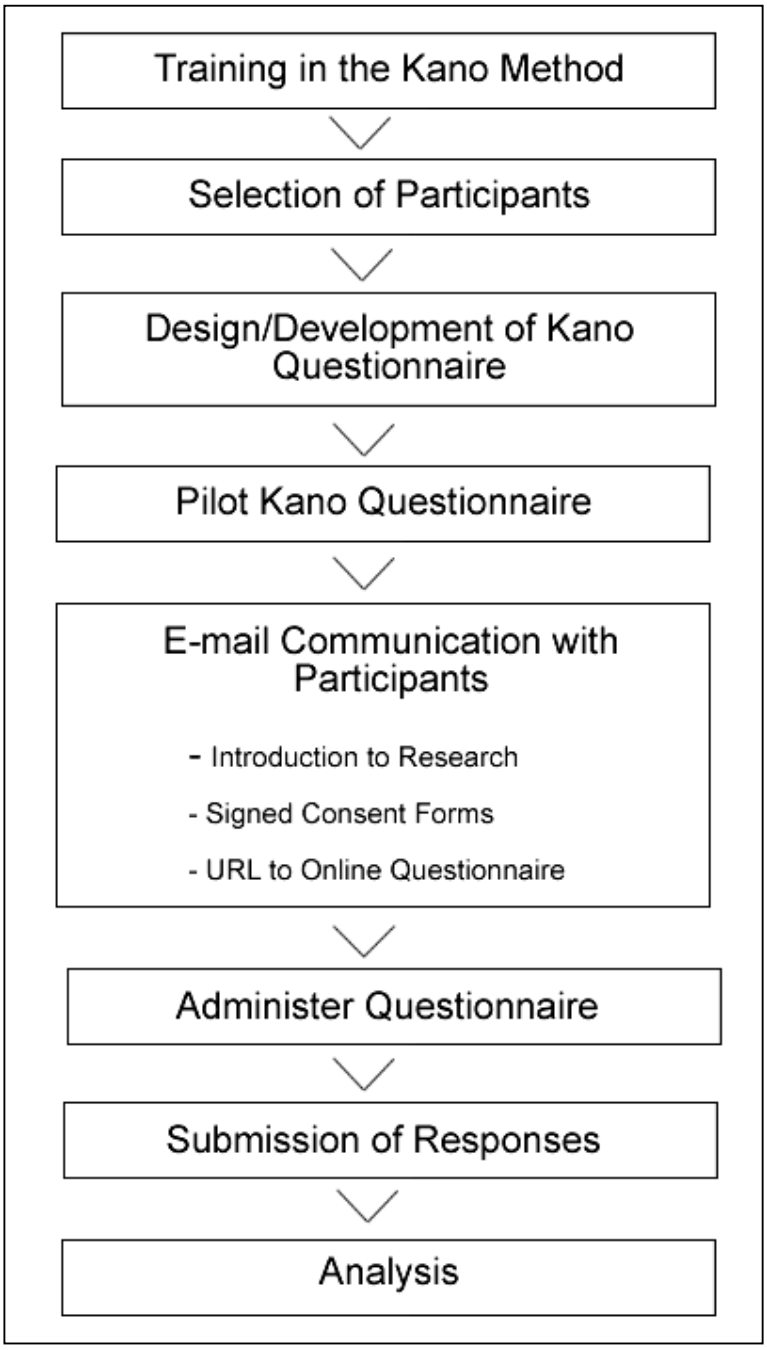
3.4.2 Research process

The Kano method was used in order to determine the benchmark requirements of an educational web portal. A comprehensive description of the Kano method detailing all components of the research process was used in order to ensure that the research was

[12] Noriaki Kano, a professor from the University of Tokyo, developed a model to understand users' perception of quality (Berger et al, 1993).
[13] System specifications describe what the system, process, or product/service must do in order to fulfill the business requirement/s (Allen, 1991).
[14] In accordance with Kano's "must-be" requirements (Berger et al, 1993).

carried out to the highest standards. Figure 3.3 provides a visual representation of the research process.

Figure 3.3: Research process



3.4.2.1 Training in the Kano method

As the researcher did not have any previous experience in conducting this type of research, it was necessary for her to receive training in the Kano method. It is noted that the supervisor of the research process has extensive experience with this type of research and was therefore able to provide the researcher with training in the application of the Kano method.

3.4.2.2 Selection of participants

A group of 20 expert users (from schools, higher education institutions, private organizations, government organizations and non-government organizations) were specifically targeted to participate in the research. Table 3.1 summarizes the number of individuals approached to participate in the research from each type of organization/institution.

Table 3.1: Targeted individuals

Organization/Institution type	**Number of individuals**
School	3
Higher education institution	3
Private organization	5
Government organization	6
Non-government organization	3

The participants were selected according to their experience and understanding of educational web portals. Each participant was competent in reading and writing English. Participants' race, sex, age and/or institutional affiliation were not used as criteria for the selection.

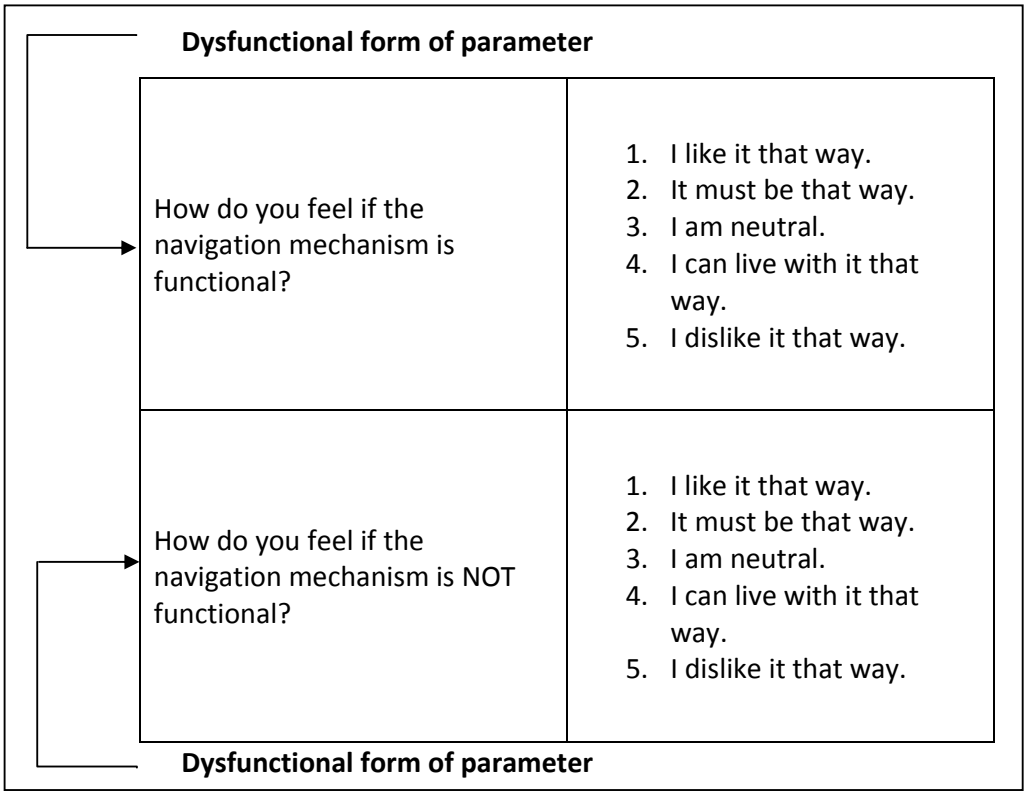
3.4.2.3 Design/development of Kano questionnaire

A comprehensive list of possible specifications (parameters) for an educational portal was constructed by examining the characteristics of educational portals globally. This information was used to develop a questionnaire in accordance with the Kano method.

According to Kano (1982, in Berger et al, 1993), one-dimensional, attractive, must-be, and indifferent customer requirements can be classified through a customer questionnaire. The Customer Requirement Questionnaire was developed by compiling 128 questions relating to possible system requirements. Each parameter was included in a functional and dysfunctional form.

See Figure 3.4 for a visual representation of this type of questionnaire.

Figure 3.4: Example of customer requirement questionnaire



Source: Berger et al, 1993

3.4.2.4 Pilot Kano questionnaire

The Kano questionnaire was tested on a group of three users who were familiar with the use and development of educational web portals. Enhancements were made to the Kano questionnaire based on feedback from these users.

3.4.2.5 E-mail communication with participants

The targeted individuals were sent an e-mail describing the research process (see Addendum A). They were requested to complete a written consent form (see Addendum B), dealing with confidentiality, anonymity and trust. Table 3.2 compares the number of individuals targeted and the number of participants, from each organization/institution, who took part in the research.

Table 3.2: Number of participants

Organization/Institution type	**Number of individuals targeted**	**Number of participants**
School	3	0
Higher education institution	3	1
Private organization	5	3
Government organization	6	3
Non-government organization	3	2
TOTAL	20	9

A total of nine expert users took part in the research; consequently the response rate was 49 per cent. Once each expert user had signed and returned the consent form, he or she was provided with the URL for the online questionnaire.

3.4.2.6 Completion of questionnaire

The expert users were required to answer an online questionnaire pertaining to the characteristics of educational web portals. Each parameter was posed in a functional and dysfunctional form.

3.4.2.7 Submission of responses

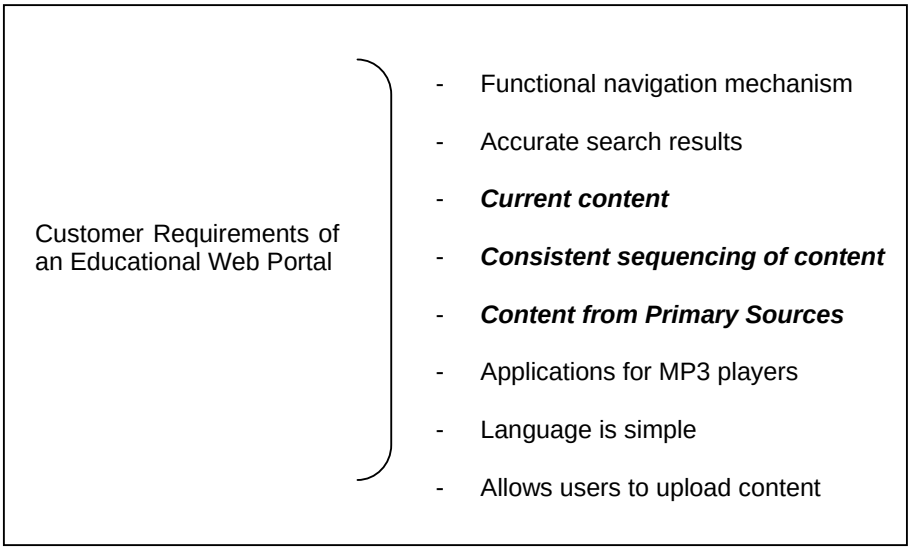
Once the participants had answered the questionnaire, they were requested to select a submit button at the bottom of the screen. The selection of the submit button activated an automated process whereby participants' responses were e-mailed directly to the researcher.

3.4.2.8 Data analysis

Data analysis took place in accordance with the Kano method. Kano (1982, in Berger et al, 1993) believes that customers' ideas about the quality of a specific product are often difficult to understand and define clearly. Berger et al (1993) explain that, according to Kano, "as the customer ideas of quality are made clear, many requirements emerge, and they fall into several groups."

See Figure 3.5 for an example of customer requirements.

Figure 3.5: Example of customer requirements



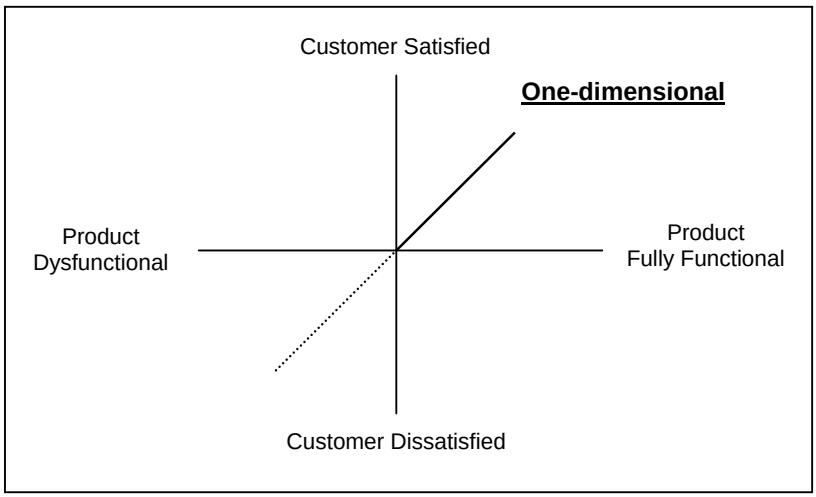
Source: Adapted from Berger et al, 1993

It should be noted that the bolded font in Figure 3.5 illustrates the customer requirements that would be grouped together as relating to the content of educational web portals. Kano's theory (1982, in Berger et al, 1993) states that one-dimensional customer requirements are relative to the level of functionality of the product. In other words, the

customers' level of satisfaction increases as the functionality of the product increases. Likewise, the customer's level of satisfaction decreases as the functionality of the product decreases.

See Figure 3.6 for a visual representation of Kano's one-dimensional requirements.

Figure 3.6: Kano's one-dimensional requirements



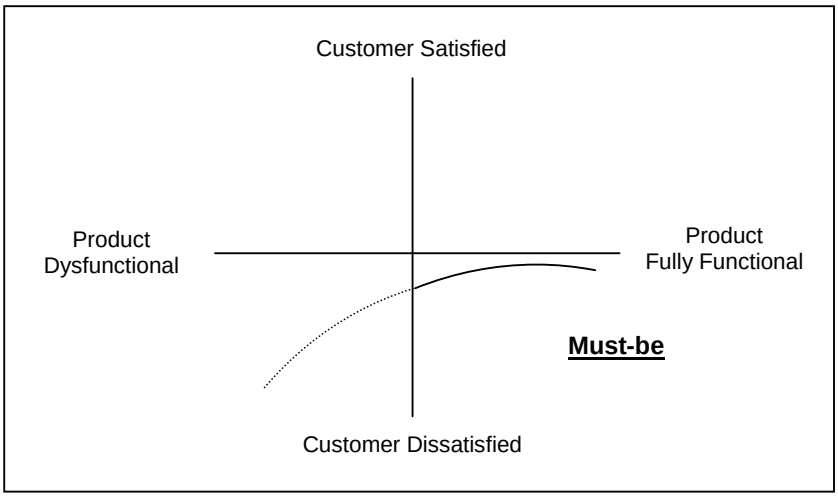
Source: Adapted from Berger et al, 1993

The horizontal axis of the Kano diagram in Figure 3.6 indicates how functional the parameters of the product are, and the vertical axis indicates the customer's level of satisfaction. According to Berger et al (1993), one-dimensional customer satisfaction "is proportional to the full functionality of the product."

An excellent example of Kano's must-be requirement would be the brakes on a car. Poor brakes or brakes that do not work properly would cause dissatisfaction among customers, but effective brakes would not raise customers' level of satisfaction since properly functioning brakes are regarded as a prerequisite. In order words, customers would be dissatisfied if the parameter was not effective or did not work properly.

See Figure 3.7 for a visual representation of Kano's must-be requirements.

Figure 3.7: Must-be customer requirements



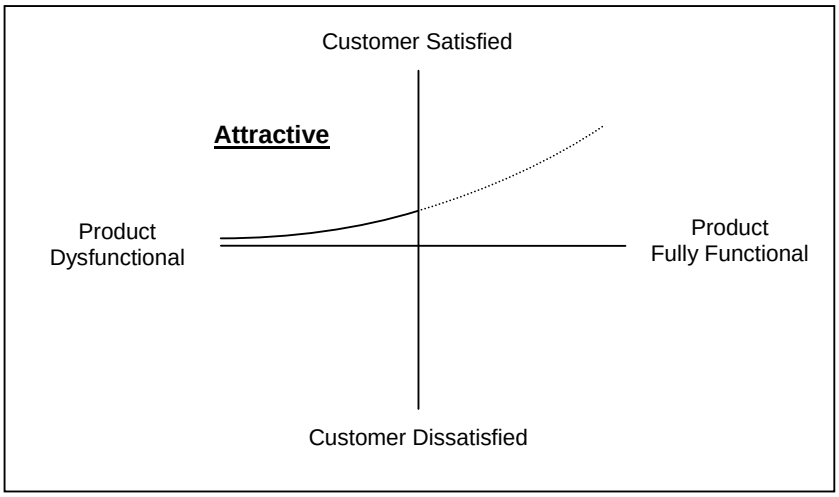
Source: Adapted from Berger et al, 1993

Kano's theory (Berger et al, 1993) states that the attractive curve illustrates the area where the customers' level of satisfaction is increased by the functionality of the product or service but is not affected by the elimination of the functionality. Berger et al (1993) explain this as follows:

> *An example of this would be the addition of specialized features such as a radio antenna that automatically lowers itself when the radio is turned off. The customer would not necessarily be dissatisfied if the feature wasn't available.*

See Figure 3.8 for a visual representation of Kano's attractive requirements.

Figure 3.8: Kano's attractive customer requirements



Source: Adapted from Berger et al, 1993

3.5 Summary

Research can be defined as a critical investigation that contributes to the understanding of a phenomenon. Design research can be defined as an endeavour that contributes to the understanding of a created phenomenon, developed by a designer, with the aim of achieving sustainable development.

Research may be divided into two parts, the first being the way in which works can be used to build knowledge (knowledge-building process) and the second being the way in which an individual can evaluate knowledge in order to devise a theory or design a process (knowledge-using process). The focus of the research study is to provide an interpretation of events and phenomena in terms of how the individuals involved perceive and understand their own experience.

The research paradigm of this study aligns with the first part, as the study makes use of works in order to create knowledge.

Chapter 4: Data Collection and Analysis

Contents

List of Addenda

(Addenda are available on the CD-Rom attached)

Addendum A - Research process e-mail

Addendum B - Consent form

Addendum C - Kano questionnaire

Addendum D - Data collected

4.1 Introduction

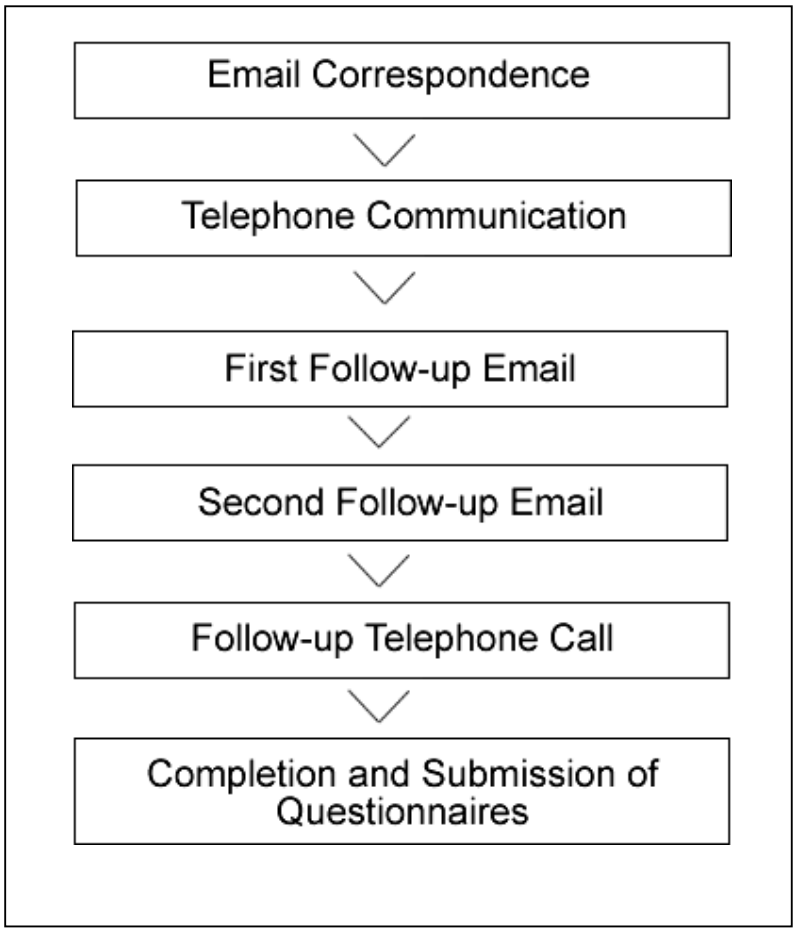
This chapter describes the data collection process. A graphical representation of the process has been included in order to demonstrate the linear procedure that was followed.

In an attempt to increase the level of participation and responses received, the data collection process consisted of intensive communication and follow-up with the targeted individuals and research participants. Processing the data involved following the five-stage process developed by Kano (Berger et al, 1993). The final stage in the process was to construct a Kano graph in order to provide a visual representation of the overall classification of each customer requirement (parameter) in relation to its position on the graph. The graph was analysed in order to compile a list of parameters that were classified as “must-be” customer requirements in accordance with Kano’s method (see Chapter 3: Research methodology).

4.2 Data collection

The data collection process involved e-mail and telephone communication with the research participants. Participants were contacted on a number of occasions in an attempt to increase the level of participation and responses received. Figure 4.1 gives a visual representation of the data collection process.

Figure 4.1: The data collection process



4.2.1 E-mail correspondence

An initial e-mail was sent out to a group of 20 expert users (from schools, higher education institutions, private organizations, government organizations and non-government organizations) (see Table 3.1). The e-mail described the research process (see Addendum A) and requested the addressees to complete and return a written consent form (see Addendum B) in token of their willingness to participate in the research process.

4.2.2 Telephone communication

One week after the initial e-mail had been distributed, the individuals were contacted by telephone to ensure that they had received the e-mail and to ascertain their willingness to participate in the research process.

4.2.3 First follow-up e-mail

During the telephone conversation a number of expert users indicated that they had failed to receive the e-mail (or rather notice the e-mail in their inbox) and requested that the e-mail be resent. This second e-mail contained the same information as the first and was sent out approximately two days after the telephone call took place.

4.2.4 Second follow-up e-mail

Approximately two weeks later, two types of follow-up e-mails were sent out. The first of these was addressed to the individuals who had failed to submit the consent form. It reminded them about the study and urged them to participate in the research process. The second e-mail was addressed to the participants who had signed and returned the consent forms but had failed to answer the online questionnaire. This e-mail reminded them of the deadline and urged them to send their responses through as soon as possible.

4.2.5 Follow-up telephone call

A final follow-up telephone call was made, one week later, to participants who had submitted consent forms but had failed to answer the online questionnaire, once again reminding them of the deadline and urging them to send their responses through as soon as possible.

A total of nine expert users took part in the research process (see Table 3.2).

4.2.6 Completion and submission of questionnaires

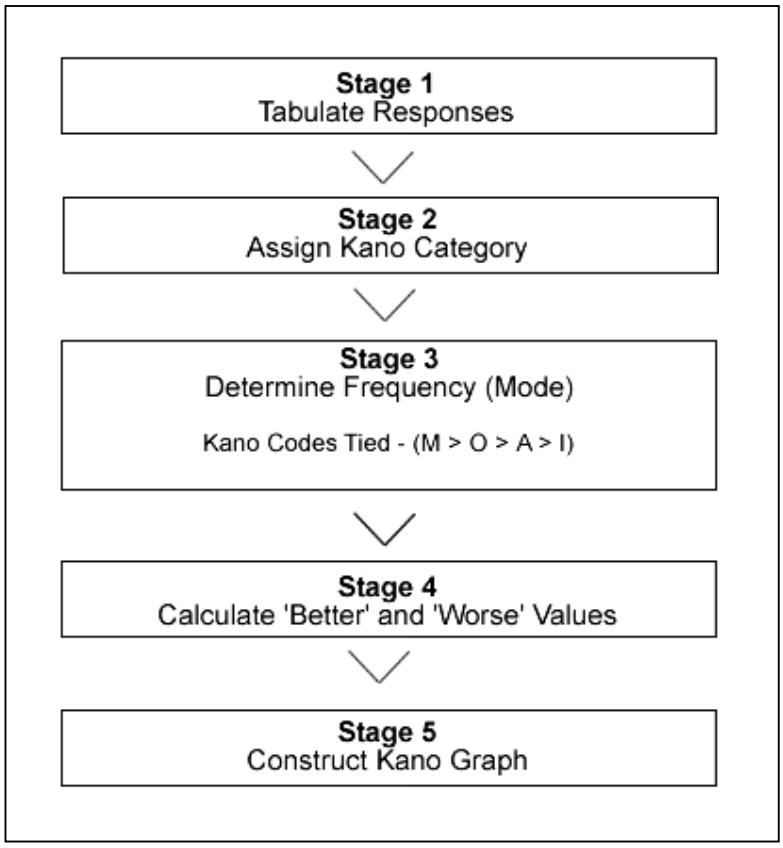
The expert users were required to answer an online questionnaire about the characteristics of educational web portals. Each parameter was posed in a functional and dysfunctional form.

Participants were requested to select a submit button at the bottom of the screen once they had answered the questionnaire. The selection of the submit button activated an automated process whereby the participant's responses were e-mailed directly to the researcher.

4.3 Data processing

Data processing involved following the five-stage process developed by Kano (Berger et al, 1993). Figure 4.2 provides a visual representation of these data processing stages.

Figure 4.2: Data processing stages



4.3.1 Stage 1: tabulate responses

The first step in the data processing process was to capture the responses of each expert user in an Excel spreadsheet (see Figure 4.3).

Figure 4.3: Tabulation of responses

	A	B	C	D	E	F	G	H	I	J
1	CR	u1	u2	u3	u4	u5	u6	u7	u8	u9
2	1	M	A	M	A	M	M	O	I	M
3	2	M	M	M	O	M	M	O	O	M
4	3	A	O	O	O	M	O	M	I	M
5	4	R	R	R	R	R	R	R	I	I
6	5	A	A	A	I	I	A	O	A	I
7	6	A	O	M	O	M	M	O	Q	M
8	7	A	A	M	I	M	A	I	M	I
9	8	A	A	A	I	M	A	I	A	I
10	9	M	M	O	O	M	M	M	O	M
11	10	O	O	M	A	M	M	O	I	M
12	11	M	M	I	O	M	M	O	Q	M
13	12	I	O	M	I	O	A	I	O	A
14	13	M	O	A	A	O	O	O	A	A
15	14	M	O	A	A	A	O	M	A	I
16	15	M	O	A	M	O	A	A	A	A

4.3.2 Stage 2: assign Kano category

The Kano method (Berger et al, 1993) states that each customer requirement (parameter) should be assigned a Kano category. The Kano Evaluation Table was used in order to assign the appropriate Kano category to each customer requirement (parameter). See Figure 4.4 for a visual representation.

The expert users' responses to each question, in both functional and dysfunctional forms, were reviewed and the appropriate Kano category was then assigned to each customer requirement (parameter) using the Kano Evaluation Table.

In other words, if a research participant's response to the functional form of the question, "How do you feel if the colour contrast contributes to the readability of the text?" was "I can live with it that way", and their response to the dysfunctional form of the question, "How do you feel if the colour contrast does NOT contribute to the readability of the text?" was "I dislike it that way", then the overall customer requirement (parameter) for that specific respondent was classified as "M" ("must-be"). (See circled "M" in Figure 4.4.) It should be noted that every customer requirement (parameter) was classified in accordance with this method.

Figure 4.4: Kano Evaluation Table

Customer requirement (parameter)	**Dysfunctional**					
Functional		1. Like	2. Must be	3. Neutral	4. Live with	5. Dislike
	1. Like	Q	A	A	A	O
	2. Must be	R	I	I	I	M
	3. Neutral	R	I	I	I	M
	4. Live with	R	I	I	I	**M**
	5. Dislike	R	R	R	R	Q

Customer Requirement is:

A: Attractive	O: One-dimensional
M: Must-be	Q: Questionable results
R: Reverse	I: indifferent

4.3.3 Stage 3: determine frequency (mode)

The next stage of the data processing process involved determining the frequency (mode) of respondents who had classified their customer requirements (parameters) in the same category. In other words, how many respondents classified a particular customer requirement as “M” (“must-be”)? This was done by adding up the total number of each category using a formula in the Microsoft Excel program. The overall classification was awarded to the customer requirement (parameter) with the highest frequency (mode). In other words, if the majority of respondents (5 out of 9) had selected “M” (“must-be”) as the classification of a particular parameter, the overall classification of the parameter was “M” (“must-be”). See Figure 4.5 for a visual representation.

Figure 4.5: Frequency of responses

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	CR	u1	u2	u3	u4	u5	u6	u7	u8	u9		A	M	O	R	Q	I	Total	Grade
2	1	M	A	M	A	M	M	O	I	M		2	5	1	0	0	1	9	M
3	2	M	M	M	O	M	M	O	O	M		0	6	3	0	0	0	9	M
4	3	A	O	O	O	M	O	M	I	M		1	3	4	0	0	1	9	O
5	4	R	R	R	R	R	R	R	I	I		0	0	0	7	0	2	9	R
6	5	A	A	A	I	I	A	O	A	I		5	0	1	0	0	3	9	A
7	6	A	O	M	O	M	M	O	Q	M		1	4	3	0	1	0	9	M
8	7	A	A	M	I	M	A	I	M	I		3	3	0	0	0	3	9	A
9	8	A	A	A	I	M	A	I	A	I		5	1	0	0	0	3	9	A
10	9	M	M	O	O	M	M	M	O	M		0	6	3	0	0	0	9	M
11	10	O	O	M	A	M	M	O	I	M		1	4	3	0	0	1	9	M
12	11	M	M	I	O	M	M	O	Q	M		0	5	2	0	1	1	9	M
13	12	I	O	M	I	O	A	I	O	A		2	1	3	0	0	3	9	O
14	13	M	O	A	A	O	O	O	A	A		4	1	4	0	0	0	9	O
15	14	M	O	A	A	A	O	M	A	I		4	2	2	0	0	1	9	A
16	15	M	O	A	M	O	A	A	A	A		5	2	2	0	0	0	9	A

4.3.3.1 Kano codes tied

In the case of a tie, where the number of respondents who selected the classification of a particular parameter was the same, the Kano method (Berger et al, 1993) states that the formula M > O > A > I should be used in order to determine the overall classification of the parameter. In order words, if the categories “M” (“must-be”) and “O” (“one-dimensional”) both have the same frequency, the “M” classification should take priority over the “O” classification.

4.3.4 Stage 4: calculate “better” and “worse” values

In accordance with the Kano method (Berger et al, 1993), stage four of the data processing process involves establishing the “better” and “worse” values for each customer requirement.

The formula used to establish the “better” values is as follows:

$$\frac{A + O}{A + O + M + I}$$

The formula used to establish the "worse" values is as follows:

$$\frac{O + M}{A + O + M + I}$$

Figure 4.6 provides a graphical representation of the "better" and "worse" values that were created using Kano formulas.

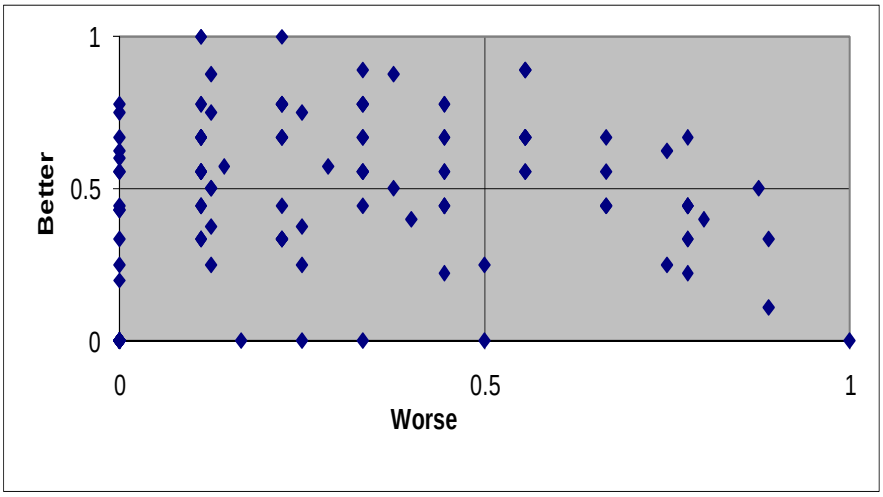
Figure 4.6: "Better" and "worse" values

V	W
Better	Worse
0.333333	0.666667
0.333333	1
0.555556	0.777778
0	0
0.666667	0.111111
0.5	0.875
0.333333	0.333333
0.555556	0.111111
0.333333	1
0.444444	0.777778
0.25	0.875
0.555556	0.444444
0.888889	0.555556
0.666667	0.444444
0.777778	0.444444
0.888889	0.333333
0.777778	0

4.3.5 Stage 5: construct Kano graph

Once each customer requirement (parameter) had been changed into digital values ("better" and "worse" values), a graph was created using Microsoft Excel. This graph is reproduced in Figure 4.7.

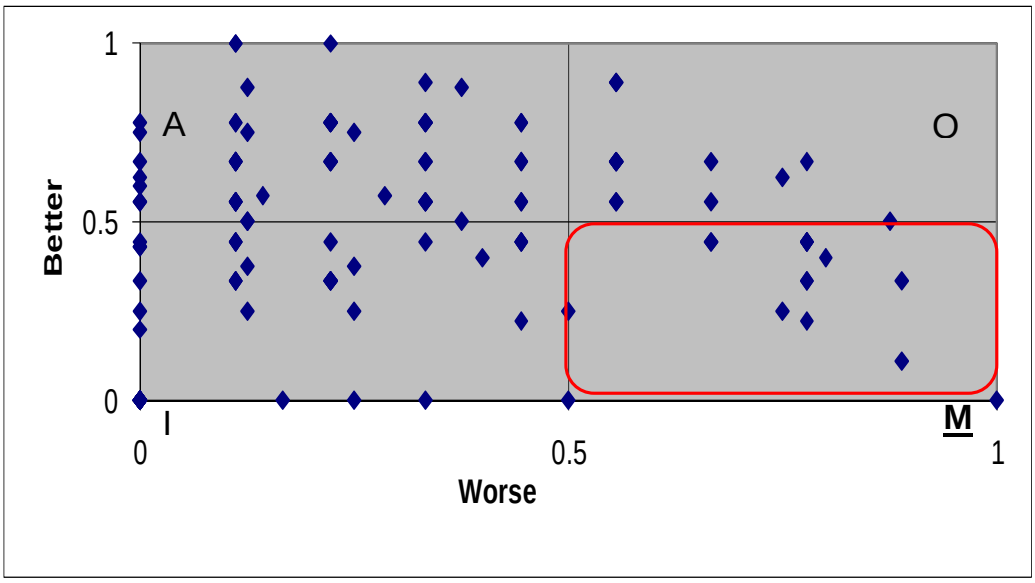
Figure 4.7: Kano graph



4.4 Data analysis

The Kano graph demonstrates the location of each point, and thus the position of each customer requirement (parameter). Figure 4.8 gives a visual representation of the overall classification of each customer requirement (parameter) in relation to its position on the graph.

Figure 4.8: Classification of parameters



The parameters positioned in the "A" quadrant illustrate the "attractive" requirements. The "O" quadrant illustrates the "one-dimensional" requirements, the "I" quadrant the

"indifferent" requirements and "M", the "must-be" requirements. The values in the "M" quadrant were analysed in order create a list of "must-be" requirements for educational web portals. The list of parameters classified as "must-be" requirements is given in Table 4.1.

Table 4.1: Must-be requirements for educational web portals

Layout
- The layout is intuitive to follow.
- The information is readable.
- The information is organized.
Navigation
- The navigation mechanism is functional.
- The navigation mechanism is intuitive to use.
- The navigation mechanism is effective (i.e. serves its purpose)
Search
- The search facility is easy to use.
- The search facility provides accurate (correct) results.
Content
Relevance
- The content is accurate.
- The content is current (up to date).
- The abstract of each resource is accurate.
Organization
- The sequencing of content is consistent.
Sources
- The credibility of the source of the content is clear.
- The content comes from a credible source.
- The usage rights (copyright conditions/terms of use) of the content are clear.
Language
- The language is simple.
- The language is coherent.
- The information contained on the web portal is spelt correctly.
Uploading content
- The upload facility is easy to use.
- The resource must be moderated before it can be found in the web portal.
- You must receive notification once your resource has been uploaded and can be found on the web portal.
- You must be able to modify a resource that you have uploaded.
Technical
- The web portal works in all browsers.

4.5 Summary

The step-by-step data collection process consisted of intensive e-mail and telephone communication with the targeted individuals and research participants. Kano's (Berger et al, 1993) five stages of data processing were followed in order to turn the data into a suitable format for data analysis. The first step in processing the data was to capture the responses of each expert user into an Excel spreadsheet. The next step was to use the Kano Evaluation Table in order to assign the appropriate Kano category to each customer requirement (parameter). Stage three involved determining the frequency (mode) of respondents who had classified the customer requirements (parameters) in the same category. In accordance with the Kano method, stage four of the data processing process involved establishing the "better" and "worse" values for each customer requirement. The "better" and "worse" values were used in the final stage of processing the data, to create a graph. The purpose of the graph was to provide a visual representation of the overall classification of each customer requirement (parameter) in relation to its position on the graph. The graph was analysed in order to compile a list of parameters that were classified as "must-be" customer requirements. According to the expert users who took part in the study, there are 23 "must-be" requirements for educational web portals. The "must-be" requirements identified concern the following key areas pertaining to educational web portals: layout, navigation, search, content and technical.

Chapter 5: Summary, Conclusions and Recommendations

Contents

5.1 Summary

Research can be defined as a critical investigation that contributes to the understanding of a phenomenon. Design research can be defined as an endeavour that contributes to the understanding of a created phenomenon, developed by a designer, with the aim of achieving sustainable development.

Research can be divided into two parts, the first being the way in which works can be used to build knowledge (knowledge-building process) and the second being the way in which an individual can evaluate knowledge in order to devise a theory or design a process (knowledge-using process). The focus of this research study is to interpret events and phenomena in terms of how the individuals involved perceive and understand their own experience. The research paradigm of this study fits into the first part, as the study makes use of works in order to create knowledge.

The aim of this research was to determine the benchmark specifications of an educational web portal. Points investigated included the following:

- What are the benchmark specifications of an educational web portal that affect specialist users' perception of quality?
- What are the minimum benchmark specifications of an educational web portal expected by specialist users?

The Kano method (Berger et al, 1993) was used in order to determine the benchmark requirements of an educational web portal.

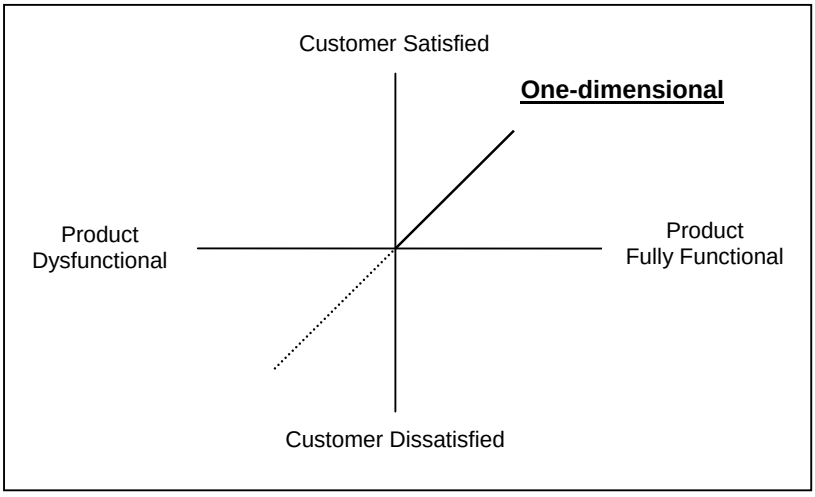
The research process involved the training of the researcher in the Kano method; the selection of participants; the design/development of the Kano questionnaire; piloting the Kano questionnaire; e-mail communication with participants; administering the questionnaire; the submission of responses; and, finally, the analysis.

5.2 Conclusion

As noted above, the Kano method (Berger et al, 1993) was used in order to determine the benchmark requirements of an educational web portal. Kano's theory is based on the assumption that a customer's level of satisfaction can be classified into different categories, the first of these categories being Kano's one-dimensional customer requirement.

Kano's theory (Berger et al, 1993) states, further, that one-dimensional customer requirements are relative to the level of functionality of the product. In other words, the customer's level of satisfaction increases as the functionality of the product increases. Likewise, the customer's level of satisfaction decreases as the functionality of the product decreases. See Figure 5.1 for a visual representation of Kano's one-dimensional requirements.

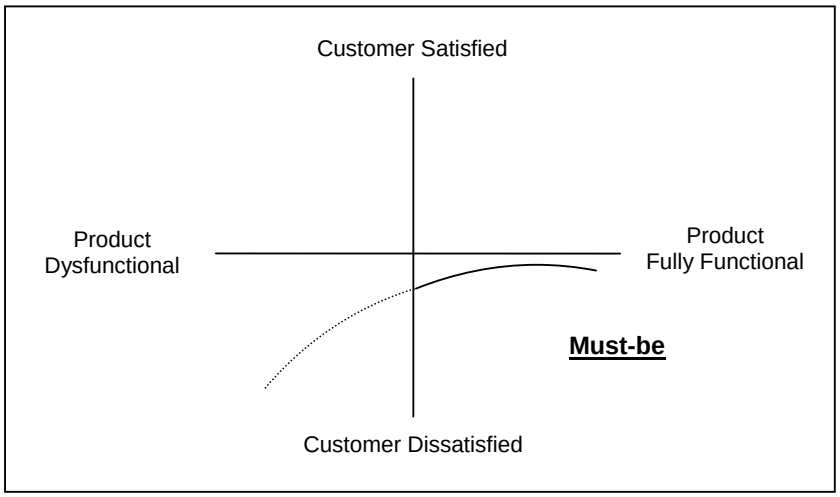
Figure 5.1: Kano's one-dimensional customer requirements.



Source: Berger et al, 1993

An excellent example of Kano's (Berger et al, 1993) must-be requirement is the brakes on a car. Poor brakes or brakes that do not work properly would cause dissatisfaction among customers, but effective brakes would not raise customers' level of satisfaction since properly functioning brakes are regarded as a prerequisite. In other words, customers would be dissatisfied if the parameter (the brakes on the car) was not effective or working properly. See Figure 5.2 for a visual representation of Kano's must-be requirements.

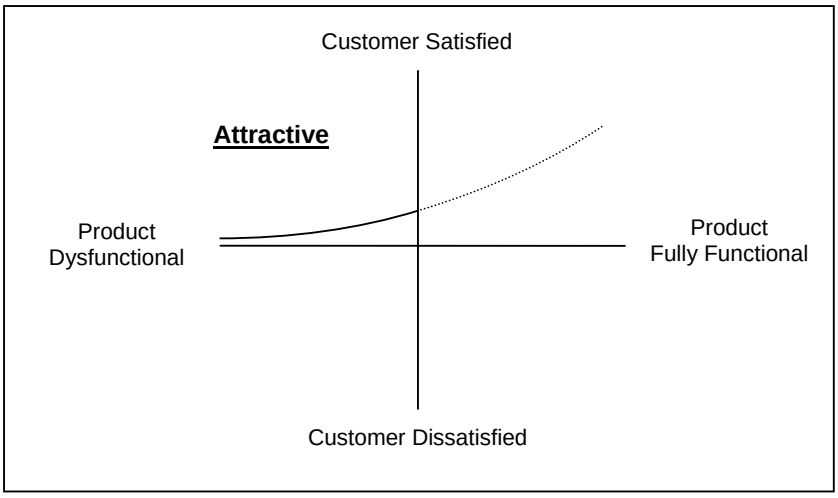
Figure 5.2: Kano's must-be customer requirements.



Source: Berger et al, 1993

According to Kano's (Berger et al, 1993) theory, the attractive curve illustrates the area in which the customer's level of satisfaction is increased by the functionality of the product or service but is not affected by the elimination of such a product or service. See Figure 5.3 for a visual representation of Kano's attractive requirements.

Figure 5.3: Kano's attractive customer requirements



Source: Berger et al, 1993

In order to determine the benchmark specifications of an educational web portal that affect specialist users' perception of quality, the overall classification of each customer

requirement in relation to its position on the graph was analysed. Figure 5.4 provides a visual representation of the overall classification of each customer requirement (parameter) in relation to its position on the graph.

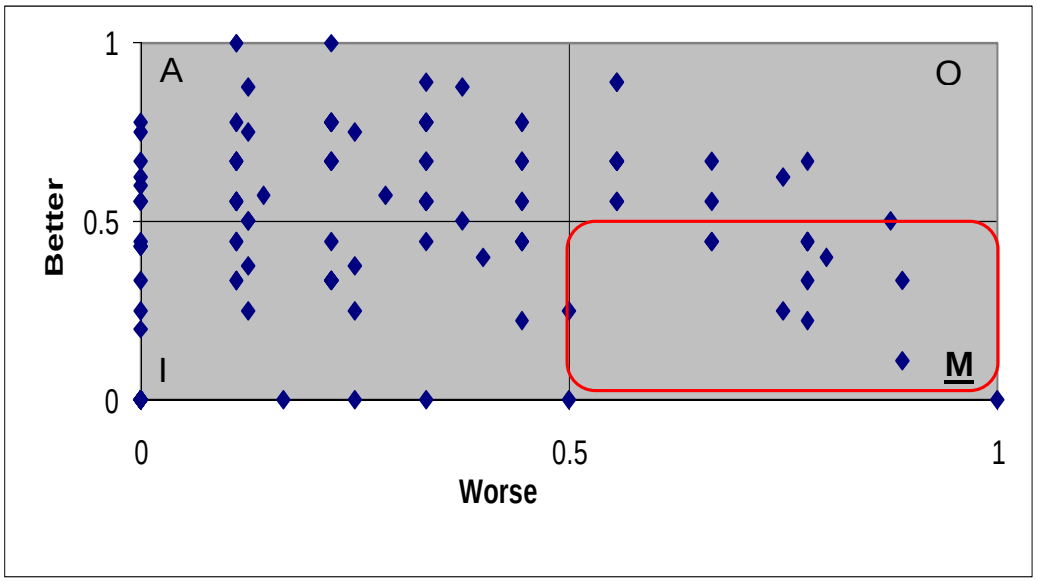


Figure 5.4: Classification of parameters

The parameters positioned in the "A" quadrant illustrate the "attractive" requirements, those in the "O" quadrant illustrate the "one-dimensional" requirements, those in the "I" quadrant illustrate the "indifferent" requirements and those in "M", the "must-be" requirements.

In order to determine the minimum benchmark specifications of an educational web portal expected by specialist users, the values in the "M" quadrant were analysed and a list of must-be requirements for educational web portals was developed. Table 5.1 lists the parameters that were classified as must-be requirements.

Table 5.1: Must-be requirements for educational web portals

Layout
- The layout is intuitive to follow.
- The information is readable.
- The information is organized.
Navigation
- The navigation mechanism is functional.
- The navigation mechanism is intuitive to use.
- The navigation mechanism is effective (i.e. serves its purpose)
Search
- The search facility is easy to use.
- The search facility provides accurate (correct) results.
Content
Relevance
- The content is accurate.
- The content is current (up to date).
- The abstract of each resource is accurate.
Organization
- The sequencing of content is consistent.
Sources
- The credibility of the source of the content is clear.
- The content comes from a credible source.
- The usage rights (copyright conditions/terms of use) of the content are clear.
Language
- The language is simple.
- The language is coherent.
- The information contained on the web portal is spelt correctly.
Uploading content
- The upload facility is easy to use.
- The resource must be moderated before it can be found in the web portal.
- You must receive notification once your resource has been uploaded and can be found on the web portal.
- You must be able to modify a resource that you have uploaded.
Technical
- The web portal works in all browsers.

Interestingly, the parameters that were classified as must-be requirements covered all the categories created. There were, however, no must-be requirements listed for range and applications, which form sub-sections of the content category.

In the content category the must-be parameters state that the resource must be moderated before it can be found in the web portal and that users should be able to edit a resource

that they have uploaded. In order to fulfil both requirements it would be necessary to include a mechanism to alert the portal moderator whenever the original holder of the resource modifies the resource and resubmits it.

5.3 Recommendations

The following recommendations are relevant to those individuals who wish to replicate the research process:

- *Increase response rate*. A limitation of the research was the small number of individuals who participated in the study. It is recommended that, in order to raise the level of participation, an incentive be offered to research participants. The number of targeted individuals approached to participate in the research could also be increased.
- *Add auto save function to the online questionnaire*. Two participants became frustrated when answering the online questionnaire. The online questionnaire did not save participants' responses periodically, thus if connectivity was disrupted or lost, all the answers captured before the disruption occurred were lost. The inclusion of a mechanism that saved participants' answers periodically, perhaps every minute, would prevent this problem from occurring.
- *Reduce the number of questions posed*. One of the participants became irritated by the tedious nature of the questionnaire (having to answer the functional and dysfunctional form of each question for 128 questions), and decided not to complete it. Reducing the number of questions posed could perhaps eliminate this problem.

The following recommendations are offered to the designers of web portals:

- Portals should contain the minimum specifications expected by expert users, as identified in this study. In other words, the web portal should be carefully scrutinised to ensure that it meets all of the must-be requirements noted in Table 5.1.
- A mechanism should be included to alert the portal moderator whenever the original holder of the resource modifies and resubmits it.
- Small font sizes should be avoided.
- Cluttered layouts should be avoided by limiting the amount of information provided on each page.

- Flashing and flickering advertisements should not be included on web portals.
- A glossary and a list of frequently asked questions (FAQs) are essential elements and should be included on web portals.
- Links to external websites should be clearly distinguishable by means of visual cues (icons).
- All portals should include a clearly visible search facility, which should be positioned at the top of the page near the navigation menu.
- The search facilities included on the portal should accommodate weak writing skills, and should overlook typing and spelling mistakes.
- The search engine should be capable of analysing users' histories of search queries and offering alternative keywords, as recommended by Yang et al, 2005.
- Sentences should be posed in the active rather than the passive voice.

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