

Applying Usability and HCI Principles in Developing Marketing Websites

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Abstract: This paper discusses why application of usability and human computer interaction (HCI) principles is essential in development of effective websites for marketing purposes. The poor usability of many websites wastes users' time, and increases their frustration. The paper explains how usability and HCI aspects were included in the new Participative Methodology for Marketing Websites, to reduce user frustration and to improve the website capabilities. This new methodology was developed after intensive study of methodologies from Information Systems Development, Methodologies for Developing Websites, Marketing Methodologies and additional detailed design techniques. The Participative Methodology for Marketing Websites was assessed by two research phases: interview and questionnaire. This paper includes only two aspects of the full research process: an overview of the research methodology; and discussion the results from the interviews and questionnaire study, focusing on usability and HCI aspects.

Keywords: Developing Websites, Usability, Human Computer Interaction and Integrated Methodology.

I. Introduction

The Internet has become an important communication tool for research, education, information and commerce. It provides abundant benefits to users in relation to access to information, business transactions and entertainment. In addition, the Internet allows "*consumers to educate themselves about the information or products at their own pace, furthermore, the consumers can instantly access only that information which is pertinent to their needs*" [14]. The key principles behind designing an e-commerce website are "*to satisfy users' wants, and to obtain their satisfaction in a competitive market of online and offline sales and information services*" [21]. However, some website developers try to mimic successful sites by copying attractive images off the internet and they create their home page without the basic knowledge of design principles. Hence, the website will never have a kind of unity, since the graphics and the texts were written and created by different writers and designers, and it will be lacking coherence. Therefore, websites should be designed for the

specific purpose, and relate to the style and branding of the organization [12]. To create an effective website, designers and users need to work together with a specific methodology to create a website that meets the requirements of the users and encourages them to revisit the website. This requires that these users feel comfortable, confident and satisfied working with the site. To ensure that a website interface is easy to use, usability and human computer interaction (HCI) principles should be applied in the website design to ensure that users can accomplish their basic tasks easily and quickly, and that users are pleased with the design, color and layout [6]; [29]. By adopting these principles, the users will be less frustrated and make fewer mistakes.

Usability is "*an expression used to describe computer systems which are designed to be simple to use by untrained users, by means of self-explanatory or self-evident interaction between user and computer*" [1; 53]. It can be evaluated by "*the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use*" [21 ; 330]. Furthermore, usability is not limited here; however, "Design for usability" incorporates product characteristics that benefit users in a particular usage context [5].

Usability is especially important for marketing websites. For example, user satisfaction and sales in e-commerce shopping sites will increase due to high usability of websites. Research has established that using usability principles in website development methodologies can provide several advantages; reducing costs and user frustration and hence increasing sales and user loyalty [10]; [23]; [26].

Flavian, Guinaliu & Gurrea (2006) declared "*website usability is a very important part of the store's image and (that) it can influence shopping behavior in a similar way to those aspects of traditional establishments*". However, poor usability in website design can cause various negative consequences: making sites difficult to navigate for some

users, causing frustration, leading users to move to other websites, resulting in decrease site traffic and hence sales [5]; [25]; [27].

The purpose of this paper is to briefly describe some of the research processes used to construct and evaluate a more effective, participative methodology for developing websites with high usability.

II. Background

The five goals of the discipline of HCI are *"to develop or improve the safety, utility, effectiveness, efficiency and usability of systems that include computers"* [9]. According to Te'eni et al. (2007, p. 22-23), the study of HCI is *"not confined merely to the interface between the computer and user"* but should be used to: *"develop more usable and successful systems; provide researchers with cohesive and cumulative knowledge for theory building, and; apply this theoretical knowledge to enhance real information systems"*.

In the past HCI was mainly focus on efficiency, effectiveness, satisfaction and to product great usability, however, currently the HCI researchers are seeking to understand and support human beings and how their interaction with systems in respect to knowing, doing and feeling [4]; [32].

HCI should seek *"to understand and support human beings interacting with and through technology"* [7; 62]. However, in the past HCI has often *"concerned itself almost exclusively with effectiveness and efficiency with satisfaction being regarded mainly a by-product of great usability"* [22]. Furthermore, some researchers indicated that HCI should be broadened to include the project aim as the ultimate goal of design [11]. This is especially important in the case of user interaction with marketing websites, given users' desire for immediate information and propensity for quick movement between sites.

Frustration is a major potential problem for users dealing with websites. It can result from errors in computer hardware, software, networking design or integration of system components, but especially from poor usability [8]. If the user's goals are unsatisfied, frustration will occur, since *"satisfaction was not achieved and hopes were suddenly thwarted. The thwarting or hindrance – terms often used synonymously with frustration – is not limited to the actual activity in progress, but relates to what the individual is expecting"* [20; 240].

Frustration in website use often occurs in response to navigation problems, both within and between sites [19]. Usability is related to *"consumer ability to know where s/he is at any time and what can be done"* [10; 3]. Designers and users should take into consideration this aspect in their website design, by having text-based navigation instead of graphic navigation as it *"loads faster and graphical navigation can provide problems for users with disabilities"* [18; 20]. In addition to this, testing should be performed with users *"to ensure that the descriptions of navigational links are clear and that the content is organized into topics that*

generally match the user's model of how the content should be organized" [18; 20].

Frustration can also result from long website loading times: *"the longer the wait for pages to load, the greater the frustration, which could lead users to quit the task or try another site to find information"*[31]. Recently, some research was carried out in respect to frustration and it was indicated that web users may experience negative emotions during their service encounter, *"in particular in the case of a firm's service failures that can result in frustration, anger or even rage"* [35; 446].

To prevent this problem, designers and users should work jointly in designing websites, which take less time in downloading graphics and video to encourage users to visit the website repeatedly [17].

Therefore, it is important that a website development methodology take into consideration the principles of usability and HCI to avoid user errors and reduce user frustration. Involving users in the design from the beginning will assist the website to be more understandable, friendly and interesting, winning the trust of site visitors by meeting their requirements.

III. Research Methodology

The main objective of this research was to develop an integrated website design methodology and to evaluate whether or not it will help the designers to meet users' requirements. There were also several minor research objectives, as follows:

- 1) To investigate whether the website development process will benefit from participation by both end-users¹ and client-customers;
- 2) To consider how designers can address the issues of usability, HCI, iteration and use of actual interaction data;
- 3) To evaluate whether or not this new methodology will satisfy the needs of the website industry in Western Australia.

An interpretive (qualitative) approach was used in this research [24]. Interviews and questionnaires were used to allow the researcher to collect an extensive variety of information from participants in the Western Australian website development industry and from information systems (IS) professionals².

The research commenced with a study of various existing methodologies for development of information systems, web

¹ This research distinguishes between two types of users: end-users (internal to the client organization) and client-customer users (external). End-users (Internal) are the real users in the client organization, who test and evaluate the website and use it to respond to the client-customer's queries. The client-customer users (external) are those who interact with the website to accomplish their goals such as purchasing goods or services from the client organization

² The companies and IS professionals in Western Australia is considered broadly representative of the industry throughout Australia.

sites and marketing. This analysis provided a “*model which aims at describing information systems methodologies, their structure, scopes, paradigms, approaches, principles, emphases, usability, coverage, flexibility and general applicability*” [16; 218]. From the information obtained a new Participative Methodology for Marketing Websites was developed. This methodology will help the designers and users to fill the gaps in the current methodologies and to reduce the frustration currently experienced by website users.

Interviews were utilized in this research to explore the type of methodology, tools and techniques that are currently used by the website development industry in Western Australia and to learn more about their technical expertise and knowledge of how to develop a website. The set of interview questions also covered questions regarding the four key principles for this research, which are user participation, real interaction, usability and iteration. The interviews were also used to obtain expert feedback on the prototype new methodology and to generate the questionnaire for the second phase of this research. From the interviews, the researcher observed that most of the industry methodologies are based on practitioner’s industry experience and knowledge derived from past projects, rather than on academic/theory perspectives.

The interviewees raised questions concerning the prototyping, testing, evaluation, implementation and maintenance stages, and about tools to encourage user feedback. From the interviews, the researcher derived several conclusions concerning the four key principles for this research and the various stages of the proposed new methodology. The online questionnaire was developed from the results of the literature review and an in-depth analysis of emerging patterns in the data from the interviewee responses [33].

The main purpose of the questionnaire was to find out how practical the new methodology is likely to be in the real world industry environment. Questions related to:

- 1) The “practicality” and “benefits” of adopting the proposed new methodology in the website industry in Western Australia;
- 2) Whether it is possible to achieve effective user participation in website design, via the new methodology; and
- 3) The various requirements for promotion and adoption of the methodology.

IV. The Participative Methodology for Marketing Websites

To create any interface or website successfully designers and users should utilize a specific methodology, which allows them to generate a system, which matches the user’s needs. A methodology should have stages and steps that need to be followed to complete the job productively. A ‘stage’ is a “*convenient breakdown of the totality of the information systems life cycle activity*”, while a ‘step’ is “*the smallest part of a design process*” [28]. The sequence of the stages and steps may not always be fixed. In some projects, iteration between stages will occur, which may “*take different forms*

and thus impact differently on what one can do with a methodology” [28]. The adopted methodology in any interface development should aim to achieve “*better end products (meeting user demands); a better development process (improving developer control and productivity); and a standardized process (enabling better systems integration and the benefits of a common approach in an organization)*” [2]. For these reasons, a designer needs to understand users’ requirements for the project before choosing the most appropriate methodology, in turn to successfully complete the work and to accomplish effective results; this is a ‘contingency-based’ approach [34].

The Participative Methodology for Marketing Websites was developed after studying a wide range of methodologies, including: lifecycle models; IS development methodologies; methodologies with explicit human factors aspects; websites methodologies; and marketing methodologies. Firstly, the researcher reviewed the methodologies to identify two aspects: 1) the stages needed for the system development process; and 2) the facilitation of the four key principles applied in this research project (user participation, usability, iteration, utilization of results from actual interaction).

Stage	Participation rating	Methodologies	Principles			
			User Participation	Usability	Iteration	Real Interaction
Planning	3	Soft System Methodology	1	0	2	0
		Human Factor Methodology for Designing Websites (HFMDW)	1	2	1	0
		Relationship Management Methodology (RMM)	0	0	1	0
		The Web Site Design Method (WSDM)	1	2	0	0
		E-Marketing Plan	1	0	0	0
		The Market-Vantage (Internet Performance Marketing) Methodology	0	0	0	0
Analysis	2	Soft Systems Methodology (SSM)	3	0	2	0
		User Centered Development Methodology (UCDM)	1	0	0	0
		Ethics Methodology	3	0	0	0
		Human Factor Methodology for Designing Websites (HFMDW)	0	3	1	2
		The Web Site Design Method (WSDM)	1	2	0	2
		Task Analysis				
Design	3	Structured Systems Analysis and Design Methodology (SSADM)	1	0	1	0
		Soft Systems Methodology (SSM)	2	0	2	0
		User Centered Development Methodology (UCDM)	1	3	1	0
		Relationship Management Methodology (RMM)	0	0	2	0
		The W3DT Design Methodology	0	0	0	0
		The Web Site Design Method (WSDM)	1	2	0	2
		Navigation				
		Prototyping				
Testing	3	User Centered Development Methodology (UCDM)	1	3	1	0
		Human Factor Methodology for Designing Websites (HFMDW)	1	3	2	0
		The Adventures Company Methodology	0	0	2	0
Implementation	2	Information Development Methodology for the Web	1	0	0	0
		E-Marketing Plan	1	0	0	0
		The Market-Vantage (Internet Performance Marketing) Methodology	0	0	2	0
		Construction				
		Promotion				
		Staff Training				
Evaluation	3	User Centered Development Methodology (UCDM)	2	3	1	0
		Human Factor Methodology for Designing Websites (HFMDW)	0	3	2	0
		E-Marketing Plan	0	0	0	3
		Measurement				
Maintenance	2	Human Factor Methodology for Designing Websites (HFMDW)	0	0	1	3
		The Market-Vantage Methodology	2	0	0	2
		EnSky’s Unique Methodology	1	0	0	1

Table 1 - Stages from Methodologies reviewed

The four key principles are considered the main foundation for this research so as to produce websites with high usability, thereby:

- 1) Involving the users in the design from the beginning;
- 2) Avoiding frustrations for the users (End-user and Client-Customer)
- 3) Making the website more approachable, friendly and interesting;
- 4) Winning the trust of the site visitors by meeting users' requirements.

Secondly, the methodologies were evaluated to assess how effectively they implement the four key principles at each stage and to identify the strongest stage in each methodology (see Table 1). In addition, the researcher identified extra stages, to be added to the proposed new methodology for marketing websites, i.e. navigation design, promotion and staff training. Finally, additional techniques (i.e. task analysis and detailed website implementation) were added to appropriate stages.

The overall structure of the new participative methodology for developing websites was adapted from the Star Lifecycle Model [11], with the evaluation and testing stages at the center of the methodology. This indicates that the designers and users will evaluate and test each stage before moving to another stage.

In this new methodology, there are processes, tools and techniques for each stage and step, which need to be carried out by the designer in order to achieve a user-friendly website. Figure 1 provides an overview of the new methodology and more detailed information is provided in previous researcher work[15].

The usability and HCI goals are part of the design stage. This stage will utilize the requirements specification from the analysis stage defining:

- 1) The desired main purpose and content of the website;
- 2) How the website will operate;
- 3) User involvement in the development process;
- 4) Profiles of likely future users; and
- 5) Usability requirements specifications.

The HCI and Usability Goals step will allow users (end-user (internal to the client organization) and client-customer (external)), analysts, and designers (internal and external) to confirm that the website design is efficient, effective, safe, has utility, is easy to learn, easy to remember, practical and provides satisfaction. There are many specific issues that need to be taken into consideration when designing website pages, such as text style, fonts, layout, graphics and color. In addition, it is important to define the specific navigation paths through the website between the entities and to establish effective communication between the interface and the hypermedia application.

The prototyping step is essential in the website design process to allow users and management to interact with a prototype of the new website to evaluate its effectiveness. This step will allow the organization to reduce costs and increase quality through early testing.

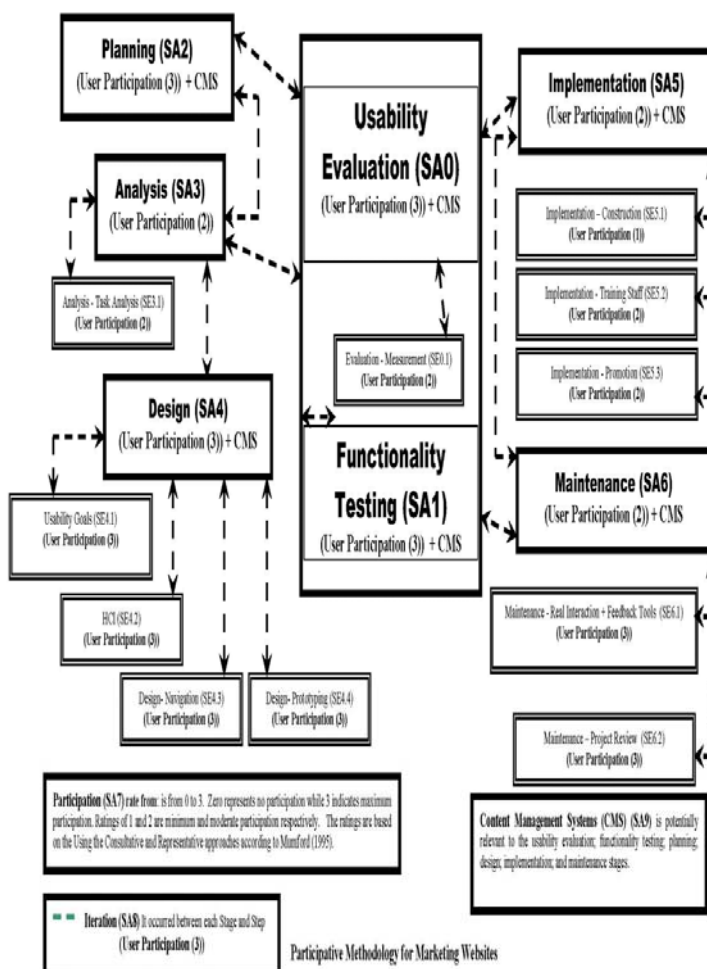
Figure 1 The New Participative Methodology for Marketing Websites

V. Evaluation of the Participative Methodology for Marketing Websites

To evaluate the new methodology the researcher collected information from IS professionals and designers involved in the website development industry in Western Australia³. This research was divided into two phases; interview and questionnaire.

The researcher provided details of her prototype new methodology and discussed it in detail with the interviewees. The interviewees raised questions concerning the prototyping, testing, evaluation, implementation and maintenance stages, and about tools to encourage user feedback. From the interviews, the researcher derived several conclusions concerning the four key principles for this research and the various stages of the proposed new methodology. There is not sufficient space in this paper to discuss all aspects of the interviews; hence, the remainder of

³ On the Australian Web Industry Association website, there were 35 web industry companies listed in Western Australia. The researcher sent a collaboration invitation letter to 29 of these 35 companies. Interviews were held with representatives of nine companies (about 25% of WA companies) and sixteen company representatives and Information Systems professionals completed the questionnaire.



this section concentrates on discussion of the HCI and usability topics.

Usability and design for effective HCI are important elements in the New Participative Methodology for Marketing Websites. These aspects are considered indispensable in order to produce a usable, effective, efficient, successful, trustworthy, user controlled, navigationally sound, speedy and secure website for the end-users and client-customer users.

During the interviews, most of the interviewees agreed that usability is critical to the development process to produce websites where users can “*find information quickly and easily*” (Company A). It will help the website to be “*free from bugs, with good navigation*,” (Company D), and “*to avoid frustration*” (Company B). According to Company C, “*Usability is very important from the marketing perspective to ensure that the application achieves the goals of the application*”.

However, after reviewing the industry methodologies, it became obvious that usability techniques were often not clearly defined. In other words, the application of usability principles is not considered as an explicit step in any stage but is an implicit part of some stages. For example, Company F stated, “*Usability is available in the first two stages in our methodology*”; these stages identify the business requirements and define what the client wants. Company A declared that usability techniques are “*available from the beginning of the design until to the end*”.

The term 'Human Computer Interaction' was new to most of the companies, with most participating web designers not recognizing the term, and therefore it has not been adopted in the terminology of their methodologies. The research concluded that more techniques for implementing HCI principles are needed in website development methodologies used by industry.

After examining the data gained concerning all the topics from all the interviews, the researcher identified the new information about methodologies provided by the industry. This was very useful for revising the New Participative Methodology for Marketing Websites, as it assisted the new methodology to become more practical.

Designing the questionnaire involved interpretation of the interview data and analysis in the context of the research questions and results of the literature review. The questionnaire was divided into seven parts, with each part addressing one key aspect of the research: User Participation; Real Interaction; Usability and HCI; Iteration; New Methodology for Developing Websites; General Questions; and Background Information about the participant.

A Likert five-point scale was used in each part of the on-line questionnaire [30]. The researcher also provided a section for participants to write down other comments regarding each set of questions. The 16 participants who completed the questionnaire were drawn (in equal numbers) from the website companies who participated in the interview phase

and IS professionals (to obtain the IS perspective regarding the new methodology, since most of the industry participants had degrees in multimedia and communication technology, but few had an academic background in Information Systems).

All of the participants strongly agreed that usability is a very important aspect of the website development process. However, about half thought that usability issues are hard to work with, especially with immature designers and new clients, since it takes time and money to learn the concepts behind it. This has led some members of the industry in Western Australia to start teaching their clients (old and new) about the benefits of adopting usability principles and techniques in the website development process.

From the participants' responses, 75% agreed that adopting usability principles in the website development process will increase the clients' profit, and 94% agreed that adopting usability principles in the website development process would encourage client-customer users (external) to revisit the website. Significantly, 94% of responses from the industry and IS Professionals agreed that HCI techniques should be part of the website development process since it is concerned with design, evaluation and implementation of interactive computer-based systems. This statement is considered very important to this research since industry's current methodologies were missing key HCI aspects. Similarly, 53% of the industry participants and IS Professionals agreed that by adopting HCI techniques in the website development process, the client's profit will be increased, and 87.5% agreed that usability and human computer interaction techniques should be part of the website development process to improve the structure and functionality of a website.

Participants' comments also supported the significance of Usability and HCI: “*Usability is a very important aspect of the website development process and usability is a measure of a certain quality of a website. The quality of usability is created during the process...*” (Company I). Furthermore, a participant from Company H stated “*Good HCI practices need to be put into practice, rather than just HCI fads. Solid understandings of HCI are often overlooked when new technologies or revisited technologies are distributed, which break many user learned conventions*”. However, IS Professional 5 stated, “*While usability is very important, many other factors influence visits to the site and profitability*”.

After reviewing the entire questionnaire responses from the Industry Participants and IS Professionals, it was clear that there was strong support for the proposed new methodology. The only key additional insight gained from the questionnaire regarding the structure of the new methodology was identifying use of HCI design principles as a separate step under the design stage. The rest of the stages and steps remained the same.

VI. Meta-Methodology Tool

The research identified the need for a new participative methodology for development of marketing websites to be

'contingent'. The data obtained from industry personnel in the interviews and questionnaires was analyzed to identify key project variables, which may be useful in a 'contingency model.' The input section of the model will include factors, which summarize the website objectives, the nature of the client organization; and project constraints (such as available time; funding; access in internal and external users; and management knowledge of, and attitudes to, HCI and usability). The output section of the model will include project methodology variables, such as: which potential methodological steps and stages to include; their priority with respect to resourcing; iteration within the methodology; evaluation and testing approaches; data gathering from real users of a prototype version of the website; and methods of involving internal and external users in the development process.

Work is continuing on an approach to implement contingency through a meta-methodology tool where specific parameters regarding the particular website project will be entered and a detailed recommended methodology tailored to the project needs will be generated. The tool is likely to also produce tailored usability criteria and guidelines, adopting the approach described by Turk [34] and subsequently trialed by his postgraduate students. It is intended that this tool will be evaluated by industry organizations in future research activities.

VII. Developments since the Research Project

The first researcher is currently running a postgraduate course to introduce the benefits of adopting usability and HCI aspects in website development process as from the research outcomes it was noticed that a majority of participants had limited knowledge with respect to the usability and HCI aspects. The participative methodology for marketing websites was introduced as a part of the postgraduate course, by providing detailed information about how this methodology was created and discussing the stages, steps, tools and techniques, which are part of this methodology. In addition, it was discussed how this integrated methodology needs to be 'contingent' and how to implement this approach via the proposed meta-methodology tool.

The content for the course was driven from the first researcher's PhD results and designed to enhance students' understanding of how to implement appropriate principles and guidelines to design and develop websites successfully and the importance of task analysis. A key aspect of assessment for the course is analysis of relevant texts and preparation of a journal summarizing key aspects of readings and personal reflections on the usefulness of the advice and how to implement it in practical ways. Students have found this approach very effective. Students provided feedback regarding the reflective journal, such as: *"The Journals were good incentive to read, because ultimately, it is the reading and critical thinking involved in the journals that I found to be the most effective learning tool"*.

In addition, beside the journal assessment the first researcher included another two assessments: two mini tests, which are consisted of a combination of short answer questions,

multiple choices and case studies. Furthermore, students are expected to contribute actively to the group discussion under the blackboard. Contributions are based on their understanding of the readings from the textbook(s); additional reading and the Internet. The first researcher checked the discussion board twice a week. Students provided feedback regarding the unit in general, such as *'The unit gives students better understandings and knowledge on Human Computer Interaction. It helps students to make more research; criticize; and discuss among other students in the class. The journals encourage reading more articles and thinking more and deeper. It also helps us to analyze the usability of websites; which is very helpful in the work world. The course was very well organized. Reading articles, writing journals and group works help me to improve my language skills. Thank you. Excellent course and I learnt a lot from the unit. Great experience for me. Learning how to design a useful interface'*.

The publication of the research findings at local and international conferences has also contributed to distribution of information about the new methodology. The researcher also plans to develop a website about the new methodology (in a similar style to the UsabilityNet (www.usabilitynet.org) website). This website will incorporate the meta-methodology software tool.

VIII. Conclusion

This paper discussed a research project, which produced a new participative methodology for development of marketing websites. Usability and HCI aspects were identified as very important, since the results from the interviews and questionnaires indicated that these techniques are poorly understood and under-utilized by industry personnel. Most of the industry participants agreed that these aspects would enhance the business by increasing sales, reducing costs of website development and maintenance, and that the clients will be pleased with the outcomes of the website. The paper also summarized the researcher's current efforts in educating industry personnel about usability and HCI and the new methodology and in developing a meta-methodology tool to implement the concept of contingency.

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Andrew Turk supervises Masters and PhD students at Murdoch University and is a University Associate at Curtin University. He taught and researched human factors in ICT for about thirty years, specializing in: design and usability evaluation of user interfaces

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