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Improving the Website Design Process for SMEs:
A Design Science Perspective

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Abstract

The success of small and medium enterprises (SMEs) in e-business is significantly affected by the quality of their websites. Currently, website designers focus mainly on improving the usability of websites. They pay less attention to the psychological, cognitive and other needs of the employees and customers who use these websites. The lack of attention to these needs leads to websites that are not well or appropriately utilised, negatively impacting the e-business ambitions of SMEs. This study adopts a design science approach (Hevner et al. 2004; March and Smith, 1995) to develop a new methodology for designing websites that takes these concerns into account. The new methodology is based on Brown's principles (Brown, 1999), as they incorporate the various concerns of users. The new methodology was used to design a New Zealand SME's website and multiple methods were used to evaluate it. The data was complemented by the results of the requirements analysis exercise and the designer's wire frame models.

Keywords

User Centred Design, Small and Medium Enterprises, Interface Design Process, User Participation, User Needs

1. Introduction

From the early days of the Worldwide Web, the Internet was seen as a channel that was particularly advantageous for small and medium-sized enterprises (SMEs). The Internet was a way to level the playing field, making it possible for them to reach markets denied them through traditional channels (Hoffman & Novak, 2000). SMEs could thus offer their goods and services to a wider range of markets, thereby increasing their customer base (Levy & Powell, 2005).

A key criterion for success in e-business is a high-quality website. For an organisation, "quality" refers to a website's ability to retain its customers' attention, provide them the information they require, and enable them to carry out the necessary transactions (Zeithaml, Parasuraman, & Malhotra, 2002). From a website user's point of view, a high-quality website is one that leads to positive affect and a sense of flow (Novak, Hoffman & Yung, 2000). However, SMEs often find it difficult to develop websites that meet these criteria because of limits on their time, budget, knowledge and manpower (Lille, et al., 2007). In addition, designers of SME websites, particularly those who operate on a freelance basis, are unwilling to conduct additional user research, as they do not believe that their clients will compensate them adequately for the extra time and money they are spending dsigning websites.

Prior research on improving the quality of websites has usually focused on design elements, such as their interactivity, navigability, and searchability (Zviran, Gleser & Avni, 2006). In

line with this, the dominant viewpoint on e-business interface design emphasises usability, which refers to the ease of use and acceptability of a system (Krieger, 2008), and is evaluated using Neilsen's (1993) usability guidelines.

In contrast to design features, this study focuses on the process by which SME e-business websites are developed. We argue that focusing on usability alone is limiting, because it emphasises only the quality of the interface and users' opinions about it. Website quality is broader than the usability of the interface. Issues such as trust, emotional attachment, and loyalty are also relevant, as they are related to customers' purchase intention (Luhmann, 1988; Krieger, 2008), which is a key goal for e-businesses. How can an organisation assess whether these concepts have been incorporated into its website? Instead of examining its design and structure, which are more helpful for studying its usability, we argue that organisations should look at the process through which the website was designed. The extent of user involvement and the breadth of domains they provided feedback on are good indications of the ability of the website to achieve these broader dimensions of quality.

Achieving good-quality design requires the active involvement of users so that designers can develop a deep understanding of them and their requirements. Thus, designers need to include concepts from sociology, anthropology, psychology and social philosophy in their practice to build trust and a strong emotional connection with their users. This study integrates the principles of user-centred design with Brown's (1999) framework to develop a process whereby the diverse needs of users', such as their psychological, personal, cognitive and social needs, are incorporated in the website interface design process. This is in line with calls for the design of information systems to be driven by a deep understanding of users, their needs and their mental processes (Berg, 1998; Dray & Siegel, 2007; Lamb & Kling, 2003).

We adopt the design science approach in our study, because of its focus on building solutions for IS-related problems (Trede & Higgs, 2009). In this case, the artefact is the process of designing SME e-business websites, not the websites themselves. The underlying idea is that an effective process that incorporates the key elements that should be considered by designers designing such websites will lead to the creation of high-quality websites from both the users' and organisation's point of view.

The next section describes the methodology used for creating a new design process. After that, we detail the artefact (the design process) used for designing the website. Finally, we present the results of the evaluation of the artefact.

2. Methodology
2.1 Overview of Design Science
March and Smith (1995) define design science as an attempt to create things that serve human purposes, as opposed to natural science and social science that try to understand reality. In other words, design science seeks to create innovations and emphasises utility, while behavioural science seeks to develop and justify theory. Design science innovations can be constructs, methods, models and instantiations. It is an appropriate perspective for this study as our focus is the creation of an artefact based on understanding human needs.

March and Smith (1995) identify "build" and "evaluate" as the two main issues in the design science. Build refers to the construction of constructs, models and artefacts to demonstrate that they can be constructed, while "evaluate" refers to the development of criteria to assess these artefacts and the process of assessing their performance. Our study will cover both of these phases.

2.2 Application of Methodology

Our objective is to develop a new process for designing websites that incorporates a broader understanding of users. To do so, we drew upon Brown's (1999) framework (Figure 1).
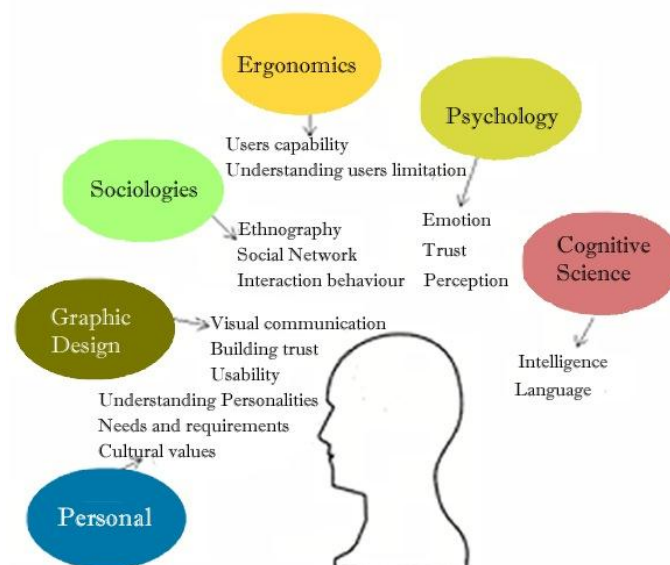
Figure 1. Some of the disciplines involved in user-centred design (UCD) (Brown, 1999)

Other prominent frameworks used in design focus on aspects of usability, psychology and/or visual communication (Garrett, 2002; Nielsen, 1993; Norman, 2002; Saariluoma, et al., 2009; Shedroff, 1999). Brown's framework, on the other hand, emphasises the importance of examining additional dimensions of users, such as their cognitive and social aspects. For example, an interface designed following Brown's principles would emphasize the visual aspects of design, as well as the social environment surrounding the task the interface supported. Brown's framework has been used for developing visual displays (Al-Qaimari, 2007) and multi-sensory displays (Chang, 2006).

To assess the appropriateness of Brown's principles as a guiding framework for design websites, ten design experts from different backgrounds, such as website designers, software designers, academics, and graphic designers, were surveyed. As expected, 80% of them considered usability to be important, and 90% agreed that involving users in the design process improves the quality and the acceptance of the website. More than 90% of them felt that the design process should also integrate the needs of users beyond usability, such as their social and emotional needs.

The existing website design process (Abels, White, & Hahn, 1998; Lowe & Eklund, 2002; Papazoglou & Yang, 2002; Spinuzzi, 2005) is based around asking clients organisations and their users about their objectives for the site. The steps in the current generic design process are: information gathering, development, evaluation and implementation. The terminology used to identify these steps may differ from one design process to another but their similarity lies in the minimal involvement of users, and thus the limited consideration of their needs. The key issue is: what information is collected during requirements gathering? Is the focus only on issues of usability, or are other issues also of concern?

The process described in this paper aims to remedy this by involving users at various stages of the process. Besides evaluating the site's usability, the users will also be asked whether the site meets their emotional, social, psychological and cognitive needs. It is important for websites to consider these aspects of users because they affect the intent of users to use a site.

For example, trust is both an emotional and logical act. Individuals expose their vulnerabilities to others, while believing they will not take advantage of their openness. The design of the human-computer interface influences the level of trust among potential customers (Egger, 2001; L. Kim, et al., 2008; Nielsen, 1993; D. Norman, 2002). Also, users have psychological preconditions that affect their response to online material. Designers should know how their users will react when confronted with certain images on websites. Lastly, designing information so that that human mind can process the content more effectively requires an understanding of the principles of information design (Spivey, 2007). Cognitive skills include artificial intelligence, language, memory, perception, learning and development and attention. Paying attention to these different aspects of users will improve their acceptance and use of a website.

3. Design process (artefact) used to design a website

This section presents the details of the new website design process Brown's principles (Brown, 1999). Once the website is constructed, we use Isbister's work (Isbister, et al., 2006) to evaluate the quality of the artefact (i.e. the new process) and the new website. The design process was evaluated with three methods: interviews, user task analysis and heuristic evaluation. Both the product and process were evaluated.

3.1   Round One of the Design Process

Round one consists of collecting the requirements of users via a series of interviews regarding their expectations of the website. An SME whose management was willing to explore new ideas in the design process and wanted to develop an e-business interface was identified. The criteria for selecting an SME for this study were:

- The SME must be either re-designing or building a new e-business website, and should have a specific target market;
- The management must be open to new ideas and participate in the interview;
- Management should be open to provide access to its designer and users

Once the SME was identified and it agreed to be part of the research project, we began gathering data from the firm' management: they provided information about the website's objectives, the target audience and the required content. The SME being studied had three target markets: tertiary students, professional coaches and parents. The website *designer* was also involved in gathering data before designed. The role of the designer was crucial as his design was exposed to the client and the users for feedback. The designer was open-minded and willing to take feedback from the users during the design process of the website.
The researcher selected five *users* who were willing to participate in the study, and interviewed them. These users were chosen because they were familiar with the Internet and had good knowledge and some interest in sports area. Data was collected from these same users at different points of the design process. These users comprised two students, two parents and a coach. Snowball sampling was used for the sample selection process. Using this approach, potential participants were contacted and asked whether they knew other users with a keen interest in sports and knowledge of the Internet.
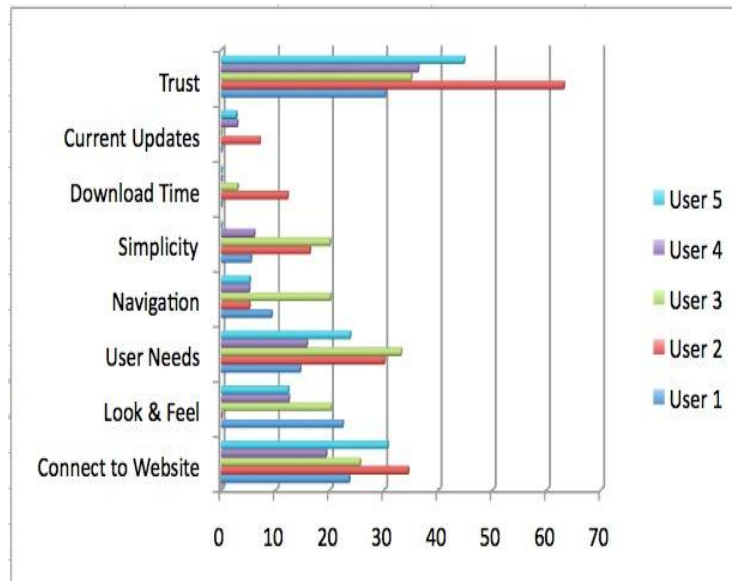
Figure 2. Results from Round One's Interview

During the first round of interviews with the users, they were asked about their requirements of the website. Trust was the main factor for the while using the website (Figure 2). Trust includes confidence in the content of the website and the organization itself. Users were less concerned about the visual design and navigation of the web site. However, they were quote keen on feeling connected with the firm through the website. The designers used this information, along with the requirements, to design the wireframe and develop a prototype.

3.2 Round Two of the Design Process:

The same users who participated in round one were interviewed about their opinions of the prototype website. The interview questions were based on Brown's (1999) principles of interface design, and the users were asked for their opinions from various perspectives: psychological, personal, sociological and ergonomics. The interview protocol was pilot-tested before being used. The questions were based on previous studies that had used Brown's theory (Al-Qaimari, 2007; Y. Liu & Salvendy, 2007; Chang, 2006). The questions asked whether the website met their psychological needs (mental challenges, comfort levels, simplicity etc), emotional needs (confidence, trust, feelings etc), social values (language used, cultural values, social belief etc), and personal needs (habits, likes, dislikes etc). The feedback from the users was provided to the designer and he proceeded to modify the website based on their comments. The screenshot below depicts the final version of the website.
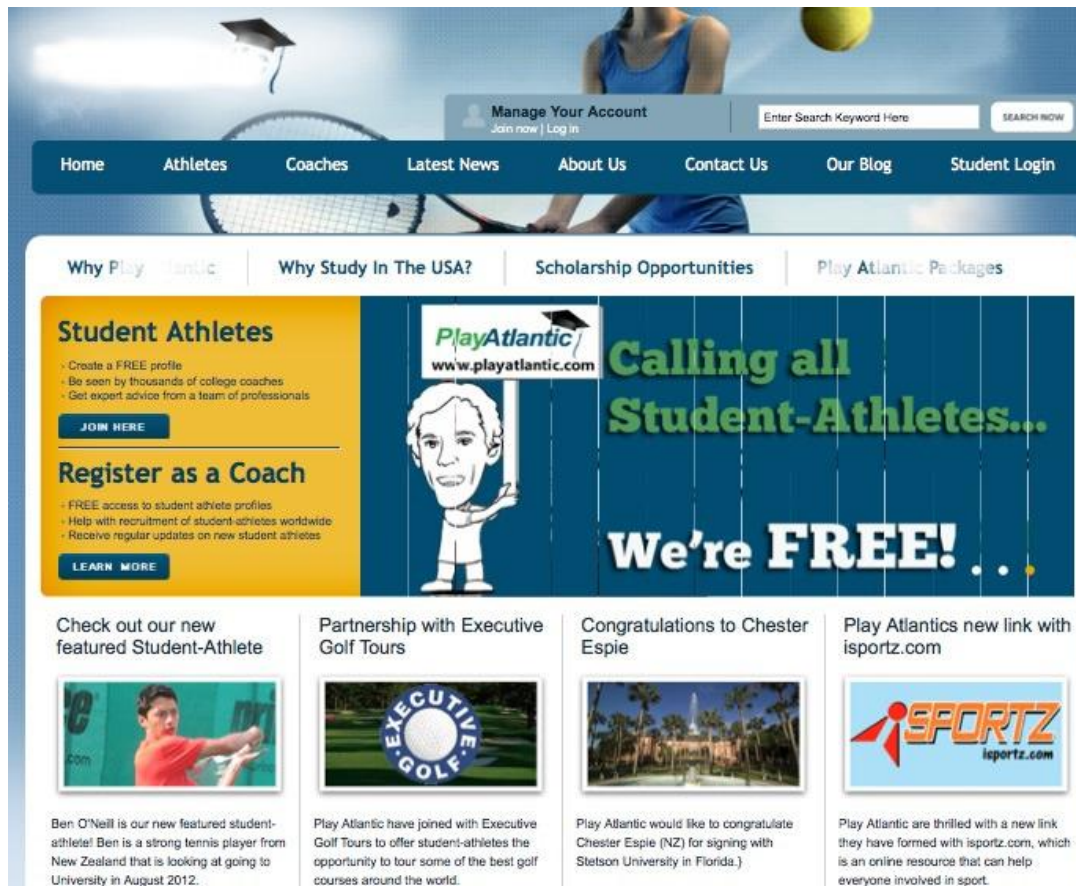
Figure 3. Website Layout Designed Based on Round Two

4. Evaluation of Artefact and Results

Evaluating design science artifacts is a challenge and many researchers has provided alternative approaches for doing so (Walls et al. 1992, Takeda, et al. (1990), Carlsson (2005). Several authors (cf. Walls et al., 1992) have distinguished between design artefacts that are products (e.g. a new IT system) and processes (e.g. a method for developing an instance of the new type of IT system).

Unlike a new product, whose effectiveness for a certain task can be compared against rival products, it is arguably more difficult to compare new processes using the same criteria. For example, a firm will not use two methods to develop two separate websites and then compare them because it would be too expensive and time-consuming for the users and management. In addition, since the SME that was studied is just entering e-business, there is no previous website that the new site can be compared against. Thus, since a good process leads to good products (Pries-Heje, Baskerville, & Venable, 2010), we evaluate the new process by evaluating the quality of the website that was built.
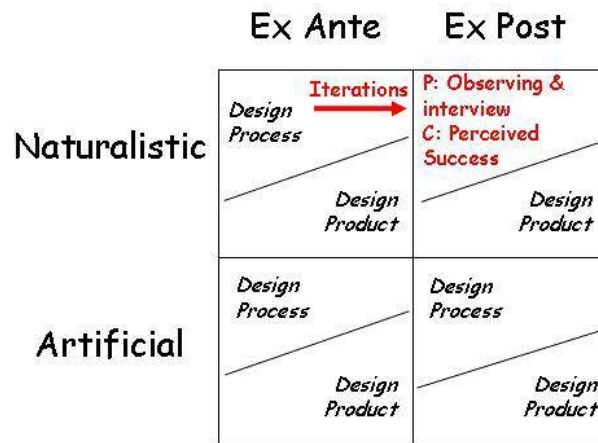
Figure 4. An ex Post Naturalistic Evaluation Strategy (Pries-Heje, et al., 2010)

The framework above (Fig. 4) (Pries-Heje, et al., 2010) specifies the different aspects of evaluation:

- *What* is being evaluated? - In this case, it was the design process.
- *How* it is evaluated? - A naturalistic method (a case study of the construction of a website) was used, as well as a user task analysis session. (Artificial evaluation refers to artifacts being evaluated in artificial conditions, while naturalistic evaluation refers to artifacts being evaluated in a more realistic environment.)
- *When* was it evaluated? - The artifact was evaluated ex post (after it was developed)
- *Who* is evaluating? - The artifact was evaluated by users and designers.

For this study, the artefact will be evaluated using three approaches, following the example of Isbister, Hook, Sharp, & Laaksolathi (2006). They used emo cards, open ended testing and a sensual evaluation instrument to triangulate the results of their evaluation. For our study, we used user task analyses, interviews, and heuristic evaluations. These methods had been compared by Ahmed, McKnight, & Oppenheim (2006) in their study of various methods for evaluating interface designs.

4.1. User Task Analysis

Six participants were selected for "think aloud" evaluation. Selecting four or five users should reveal most of the problems of the website (Nielsen, 1993; Virzi, 1996). The users were randomly selected from an undergraduate population, and were asked to perform five tasks on the new website. They were encouraged to speak out what they were processing in their minds while performing the task. Prompting and echoing was used to encourage participants to think out loud. To reduce the level of bias, these participants were a new group of users and not the same as those who had participated in the design process.

Each participant was asked to perform these tasks:
Task 1: Find athletes who play tennis.
Task 2: Find out if an organisation guarantees a scholarship.
Task 3: Find out where you can see the video of a selected player.
Task 4: Find some information for parents who wish to enroll their children.
Task 5: Find a detailed brochure about various packages.

The tasks were selected based on the expectations of what could be accomplished by athletes,

coaches and parents through the sites. The table below shows the results of user task analysis along with the time taken by each participant to complete five tasks.

User	Time taken (in Mins)
User 1	7.38
User 2	5.19
User 3	10.52
User 4	9.11
User 5	5.09
User 6	6.50

Table 1. Time Taken by Users to Complete Five Tasks

Psychological analysis
From Table 1, the time taken by the all users varies significantly. This is because each user processes and reacts to the interface differently- we are conditioned when using websites. When users see an image next to some information or any prominent image, they tend to click assuming that it is a hyperlink. 5 out of 6 participants tried to click on an image assuming that image was a button/hyperlink. Most of the users preferred images rather than reading the information and clicking on the word "more info".

Cognitive analysis
Most of the users tried to connect with the heading of the sections to link to the relevant information they were searching for. The findings suggest that not many users read all of the information on the website. They scanned or glanced at the information provided on the website and tried to relate to the words. The users did not like getting distracted with the animation when they were trying to process the information mentally and correlate it with the hand movements. When a user is trying to read information at the same time as the animation is playing, they cannot concentrate. They feel it is a distraction and draws them away from their primary purpose. As one of the users described, *"(the) site is a bit too animated for my liking; I don't like too much animation- it diverts my attention"*.

Emotional and Trust Analysis

The homepage is very important for users, as it is the place from which they connect with other sections of the website. If they feel lost, they usually tend to return to the homepage and start their search again. This action makes the user feel safe and secure, and provides reassurance that they are in the right place. The results showed that all of the users preferred to return "home" when they could not find what they were looking for. One of them mentioned that he "*... would go to home probably because it is important place to find all information*".

4.2. Interviews
A third round of interviews was held with the five users who participated in the initial design process. The aim of these interviews was find out whether the users felt that the final design of the website had improved after implementing the feedback from the second round.
- The users felt safe and confident because one or more options were provided to navigate the site. There was a feeling of trust and security and they did not fear getting lost on the website.
- Including information about the organisation and the indivduals involved in the organisation created a feeling of personal involvement with the site, and made the users feel that they could trust the organisation and the content.

- Personal information on the website made it appear more personalised and credible.
- The stylish look of the website implied high business standards, enhancing the organisation's social status.
- Providing testimonials and a blog that was not moderated made the users feel that the firm was genuine and enhance their sense of belonging.
- As the website included links to the firm's YouTube channel, Facebook page and Twitter account, the users felt that the organisation was connected with the target market and was working to build social bonds with the customers.

The last evaluation method (expert evaluation) is in the process of being carried out. The experts will be asked to compare conventional design process and the new design process on a range of criteria. In the future, an additional means of evaluating the process' efficacy will be to compare the quality of two SME websites, one designed with the conventional design process and the other with the new design process.

5. Conclusion

SMEs are motivated by the perceived benefits of adopting e-commerce including increasing competitiveness and efficiency, and reducing costs. However, there are still barriers that are preventing some SMEs from embracing e-commerce, and a key barrier is building a high-quality website. The aim of this study was to develop a process for designing high-quality websites for SMEs that met the varied needs of their users, instead of focusing only on usability, which is the dominant focus of mainstream website design processes.

The new process was evaluated through a case study in which an SME used the design process to design its first website. The quality of the process was evaluated in multiple ways, including a task analysis and interviews with users. The evaluation results indicate that the website is able to meet the broader needs of the users, while still being usable enough such that tasks can be completed fairly efficiently. In the future, we hope to articulate the various aspects of users' needs in a more fine-grained fashion and to develop more accurate tests to assess whether they have been met.

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