

Designing with Patterns: Possibilities and Pitfalls

Janet Wesson & Lester Cowley

University of Port Elizabeth, PO Box 1600, Port Elizabeth, South Africa

csajlw@upe.ac.za, csanlc@upe.ac.za

Abstract: It is widely accepted that design patterns can be used to represent solutions to frequently-occurring design problems. Pattern-based design, however, is a relatively recent approach that needs further research. The methodology is not well established and few empirical studies of pattern use exist. This paper discusses several possibilities that patterns offer as well as the potential pitfalls that exist. An example pattern language for E-commerce is presented and compared with corresponding guidelines for E-commerce. This pattern language is also used to critically evaluate the design of a good E-commerce site in South Africa, Kalahari.net.

Keywords: design patterns, E-commerce, usability evaluation, user-centred design

1 Introduction

Patterns and pattern languages have been of interest to members of the Human-Computer Interaction (HCI) community for several years, although the number of people involved has been relatively small (Erickson, 1998), (Tidwell, 2003). There are, however, several useful resources and collections of HCI design patterns available on the Web (Borchers, 2002), (van Welie, 2003).

Recently, several groups of HCI practitioners and system developers have started to become interested in HCI design patterns as one element of a set of useful interface design tools (including principles, guidelines and style guides) (Mahemoff and Johnston, 1998), (Wesson, 2001). The first book on interaction design using patterns was published in 2001 [Borchers 2001]. This was followed by the first book containing a comprehensive pattern language for Web site design (van Duyne, Landay and Hong, 2003).

The aim of this paper is to discuss how pattern-based design can be included in the user-centred design process. A case study from E-commerce is used to highlight the differences between guidelines and patterns. A heuristic evaluation of a South African E-commerce site, www.Kalahari.net, using these two approaches, revealed the strengths and weaknesses of each. These are discussed and some further research questions for pattern use proposed.

2 Pattern-based Design

A design pattern captures the essence of a successful solution to a recurring design problem. It consists of a name, ranking, sensitizing example, context of use, problem statement (described in terms of conflicting forces that exist), examples of known use, solution, sketch, references to related patterns and a summary (Borchers, 2001). A complete set of related patterns is known as a pattern language.

Design patterns have a variety of uses, and can be used in a generative as well as an evaluative capacity. Pattern-based design is, however, a relatively recent approach, which has not been widely documented or researched (UsabilityNet, 2003). The strength of this approach lies in its potential to bridge the gap between high-level requirements and design (Wesson, 2001), (UsabilityNet, 2003). Design patterns may be used during requirements elicitation to make end users aware of design pattern examples and also to aid designers with the development of initial prototypes. They can also be used to evaluate existing designs or to assist in design choices, thus supporting the iterative design process.

The concept of user-centred design is especially relevant for Web site design, where it sometimes referred to as customer-centred design. In the book by (van Duyne, Landay and Hong, 2003), customer-centred design is defined as comprising three parts: principles, processes and patterns. Principles are seen as guiding the entire design process and

representing the foundations for the patterns. The processes describe how to put the principles into practice and the patterns provide solutions to common design problems, which can be tailored to the specific customer's needs.

3 Case Study: E-commerce

Usability has become a key factor for the success of E-commerce (Nielsen, Molich, Snyder and Farrell, 2001). The first law of E-commerce states that if customers are looking for a product but they cannot find it, they simply cannot buy it. Considerable time and effort has thus been spent on designing usable E-commerce sites and developing E-commerce guidelines and patterns. Despite these, however, many E-commerce sites are still designed with poor usability (Barnard and Wesson, 2003). This section will examine some guidelines for E-commerce and compare these with related patterns from (van Duyne, Landay and Hong, 2003). An evaluation of a South African E-commerce site, www.Kalahari.net, will be used to highlight the usefulness of each of these.

3.1 E-commerce guidelines

A comprehensive set of E-commerce guidelines based on empirical research can be found at (Nielsen, Molich, Snyder and Farrell, 2001). An extract of the first few categories of guidelines is given in Table 1 below.

A: Category Pages	
A1	Category Pages: Store Home Pages
a	Show what merchandise you sell and don't sell.
b	Beware of over-emphasising promotional items.
c	The home page should show purpose of the site.
d	Don't hide the catalogue – enable shopping from the home page.
e	Reveal the product hierarchy.
f	Provide links on the home page to purchasing options, return policy, shipping and delivery information.
A2	Category Pages: Classification Schemes
a	Choose classifications that are useful to your customers.
b	Consider multiple classification schemes.
c	Provide cross-references.

d	Classify items consistently.
e	Don't over-classify.
B: Product Pages	
B1	Product Pages: Product Description
a	Provide the product details customers want and need.
b	Speak the customer's language; avoid jargon and clever names.
c	Be specific.
d	Don't present too much detail at once. Layer the information.
e	Consider providing reviews and/or ratings.
f	Explain details that cannot be seen in the product image.
g	If you must use downloads and plug-ins, make the installation process as transparent as possible.
h	If the technology isn't reliable, leave it out.
i	Facilitate cross-selling and up-selling without annoying or distracting users.

Table 1: Extract from Guidelines for E-commerce

3.2 E-commerce patterns

A comprehensive set of patterns for personal E-commerce is given in (van Duyne, Landay and Hong, 2003). This book, however, does not give any diagram to illustrate the structure and relationships between these patterns. A dependency diagram was thus drawn to depict some of these patterns and is given in Figure 1 below.

The solution for the personal E-commerce pattern contains references to several other patterns. The pattern names are given in capital letters and each pattern has a pattern number, such as A1. The solution for pattern PERSONAL E-COMMERCE (A1) is given as follows: Create an UP-FRONT VALUE PROPOSITION (C2) on your HOMEPAGE PORTAL (C1), and provide clear links for everyone for SITE ACCESSIBILITY (B9). Give customers MULTIPLE WAYS TO NAVIGATE (B1), make sure that you have BROWSABLE COTENT (B2), and provide CLEAN PRODUCT DETAILS (F2) so that people can compare different offers, pick the products or services they want by putting them in the SHOPPING CART (F3), move through your QUICK-FLOW CHECKOUT (F1) and, if necessary, take advantage of EASY RETURNS (F9).

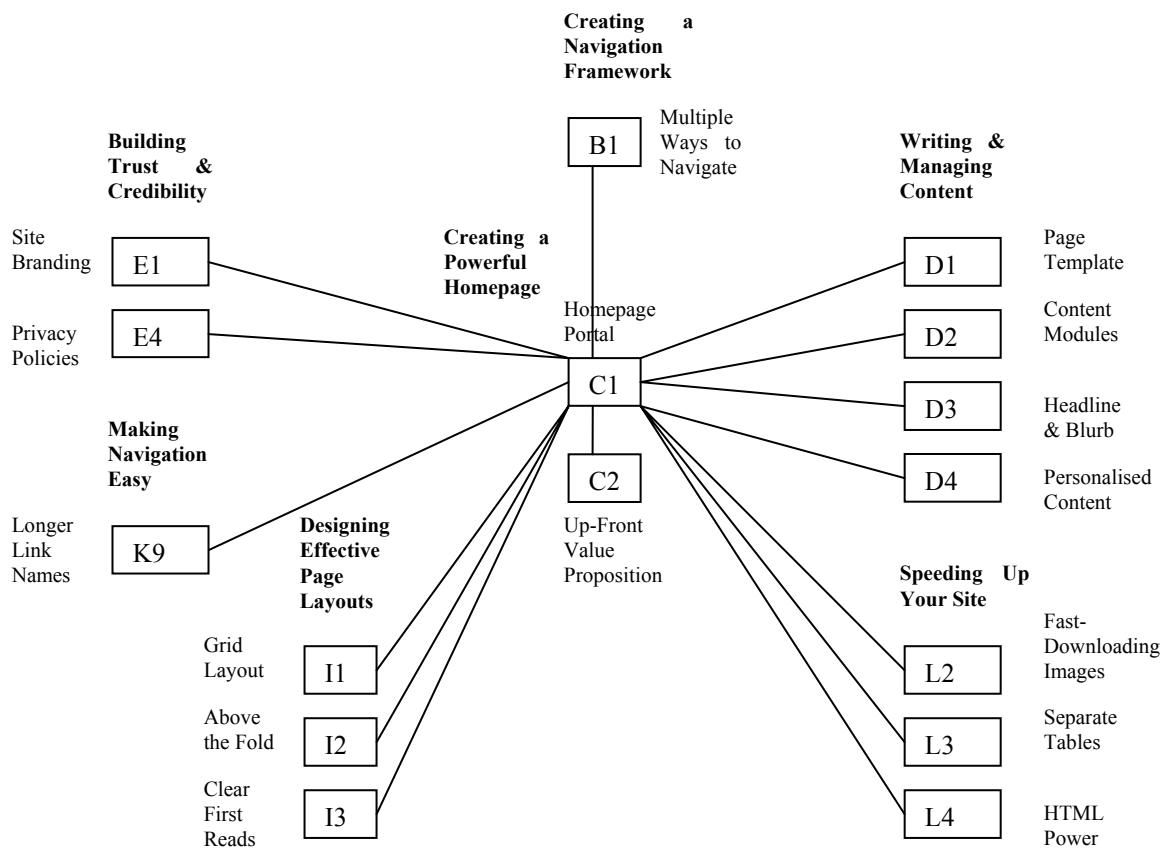


Figure 1: Dependency Diagram for Personal E-commerce patterns

3.3 Example: Kalahari.net

An empirical investigation into E-commerce in South Africa was conducted in 2002 (Barnard and Wesson, 2003). Four South African and one international E-commerce site, Amazon.com, were evaluated under controlled conditions in a usability laboratory involving sixteen South African participants. The results of this research revealed that the South African site, www.Kalahari.net, was the most efficient site for finding information. A screenshot of this site is given in Figure 2 below. Although Amazon.com was evaluated to be the most effective site for finding information, none of the participants elected to purchase from this site due to currency conversion issues. Kalahari.net also scored the highest ratings for satisfaction, followed by ExclusiveBooks.com.

A partial heuristic evaluation of Kalahari.net was conducted by the authors using the guidelines in Table 1 and the related patterns in Figure 1. The site design was found to comply with most of the guidelines in Table 1, with the exception of guideline A1b (Beware of over-emphasizing promotional items). A large portion of the home

page of Kalahari.net is devoted to best-sellers and recommended items (Figure 2).

The site was also evaluated using the relevant patterns in the PERSONAL E-COMMERCE (A1) pattern. This evaluation revealed that most of the patterns were evident in the design, especially UP-FRONT PROPOSITIONING (C2), MULTIPLE WAYS TO NAVIGATE (B1), CLEAN GRID LAYOUT (I1), PERSONALISED CONTENT (D4) and FAST-DOWNLOADING IMAGES (L2). Evidence was also found, however, of another pattern, CATEGORY PAGES (B8), which was not included in the solution for PERSONAL E-COMMERCE.

3.4 Discussion

The above evaluation revealed several advantages of the use of guidelines as an evaluation tool as compared with patterns. These were as follows:

- The guidelines are short, easy to read, easy to understand and easy to remember after a short period of use.
- The guidelines are quite easy to use as a checklist-type evaluation tool, they are

quick to use and brief comments about the site can be recorded.

- The guidelines do not provide assistance in evaluating the quality of the design.
- The patterns are relatively long, must be studied and reflected upon before use, and an understanding of the links and related patterns must be formed.
- Patterns are not generally as easy to use as checklist-type evaluation tools as guidelines.
- The pattern names are very important; some of the pattern names were not obvious and hindered an understanding of their purpose.
- The patterns do not directly correspond to the customer's tasks and thus to the user's cognitive model. In this respect, the E-commerce patterns as proposed by (van Welie, 2003) are better.
- The PERSONAL E-COMMERCE pattern language is incomplete and does not contain references to all the necessary patterns, although these do exist in the corpus (e.g. CATEGORY PAGES).

Figure 2: Screenshot of www.Kalahari.net

4 Further Research

Several research questions remain to be answered about patterns and pattern use in interface design.

These questions include the following:

- What metrics can be used to evaluate a pattern? (e.g. usability, utility, completeness, complexity.)
- How can you select the most appropriate pattern to be used in a given situation? (e.g. rating, frequency of use, task fit, empirical evidence.)

- Can design patterns be effectively incorporated in the user-centred design process? (e.g. methodology, empirical studies.)
- How do you determine the benefits of using a patterns-based design approach? (e.g. time to develop initial prototype, artefact quality, number of design iterations required.)

5 Conclusions

Design patterns offer many opportunities for user interface design but existing pattern collections are flawed and empirical evidence of pattern use is limited. As an evaluation tool, guidelines may be easier and more effective to use than patterns. More research is needed to empirically validate and refine current pattern collections. Several research questions also remain to be answered, most notably how to evaluate patterns and a formal methodology for using patterns for interface design and evaluation.

References

Barnard, L. and Wesson, J.L. (2003): Usability Issues for E-commerce in South Africa: An Empirical Investigation (To be published). *Proc. Annual Conference of the South African Institute of Computer Scientists and Information Technologists (SAICSIT 2003)*, Gauteng, SOUTH AFRICA.17-19 September 2003.

Borchers, J.O. (2001): *A Pattern Approach to Interaction Design*. John Wiley & Sons, Ltd.

Borchers, J.O. (2002): hcipatterns.org: The HCI Patterns Pages. <http://www.stanford.edu/~borchers/hcipatterns/> (Last updated: 2 Feb 2002).

Erickson, T. (1998): The Interactions Design Patterns Page. http://www.pliant.org/personal/Tom_Erickson/InteractionPatterns.html (Last updated: June 2002).

Mahemoff, M.J. and Johnston, L.J. (1998): Pattern Languages for Usability: An Investigation of Alternative Approaches. *Proc. Asia-Pacific Conference on Human-Computer Interaction (APCHI) 98*, Shonan Village, Japan. 25-31, TANAKA, J. (ed) Los Alamitos, CA: IEEE Computer Society. July 15-17 1998.

Nielsen, J., Molich, R., Snyder, C. and Farrell, S. (2001): E-Commerce user experience: High-level strategy. Nielsen Norman Group. <http://www.nngroup.com/reports/ecommerce>

Tidwell, J. (2003): UI Patterns and Techniques. <http://time-tripper.com/uipatterns/index.php> (Last updated: 25 July 2003).

UsabilityNet (2003): Interface Design Patterns. http://www.usabilitynet.org/tools/design_pattern.htm (Last updated: June 2003).

van Duyne, D.K., Landay, J.A. and Hong, J.I. (2003): *The Design of Sites: Patterns, principles, and processes for crafting a customer-centered web experience*. Boston, Addison-Wesley, Pearson Education.

van Welie, M. (2003): Web Design Patterns. <http://www.welie.com/patterns/> (Last updated: 16 July 2003).

Wesson, J.L. (2001): The Role of HCI Patterns in Software Development. *Journal of Research and Practice in Information Technology: Special Issue on HCI* 33(1):42 - 53. February 2001.