Generating User Interface Design Patterns for Web-based E-business Applications

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Abstract: The goal of the research[1] was to identify UID patterns for a web-based e-business application for the B2B market segment. The result of the research project was a set of e-business patterns of which the pattern product finder is shown as an example. The benefit of using UID patterns according to existing design recommendations such as principles and guidelines will be discussed.

Keywords: User interface design patterns, E-business application, B2B, indirect search, product finder, design recommendations

1 Introduction

For highly technology driven WWW-applications UI design has to catch up with the increasing technical development permanently. Patterns are a solution to meet this challenge.

Based on the pattern idea of the architect Christopher Alexander (1979) a UID pattern is a textual and graphical description, which follows a well defined structure. It gives a quick overview of a proven solution. The writing and use of patterns in the field of UID establishes little by little.

An international research project was started by the Siemens AG in 2000 to identify user interface design patterns for web-based e-business applications. The focus was on user interfaces for a PC marketplace for B2B. To identify patterns, a usability approach (Nielsen 1993) was applied. 18 representatives of the target user group "purchasing agent for PCs" from the USA and Germany were involved. With the help of these representatives requirements were gathered, user interfaces designed and evaluated. After redesigning the user interfaces they were described as user interface design patterns. At a later stage we recognised that van Welie (2002) started to publish similar patterns for e-commerce at his web page. The main difference to the work of van Welie is that he collects patterns whereas in our approach we generate patterns by using the UID design lifecycle. The following method to generate UID patterns has been applied:

- Gathering user requirements (focus groups: Germany and USA; pluralistic walkthrough: Germany)
- Design & Prototyping
- Usability Testing (Germany and USA)
- Redesign
- Writing UID patterns

2 Scope

In order to describe adequately the tested patterns the existing pattern format (Alexander 1979) was adapted and extended by design factors (section 4.5).

Several sets of pattern have been generated One of the outcomes of the pattern set "indirect search" is the UID-pattern "product finder" which is described as an example below (section 3). The set

[1] Research conducted: 2000-2002, sponsored by Siemens AG, Corporate Technology, Competence Center of User Interface Design, Munich, Germany

also includes the patterns “product catalogue”, “configuration”, “product comparison” and “listed results” as possible navigation to a product using a web-based e-business application.

3 Design recommendations

To reach the goal of a user centered design, persons involved in the design process do not have to start from scratch. Several description formats are common throughout the user interface community. Besides UID Patterns there are different types of design recommendations such as norms/principles, guidelines, conventions/styleguides and design-rules. IBM (2002) distinguishes between principles, guidelines and convention styleguides. Degen (2002) adds the categories “design rules” and “UID Patterns” (table 1).

In figure 1 all recommendations are contrasted according to their textual description or graphical representation and sorted by the grade of design quality including user, platform and use context.

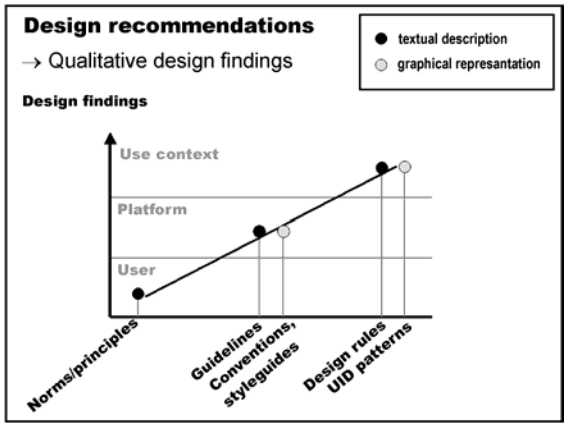

Figure 1: Quality of design recommendations.

In norms/principle, the focus is on the user’s basic needs and advice is described abstractly. Guidelines are based on user’s basic needs, but also contain platform specific information. Usually they are described in a textual form. Conventions/styleguides are at the same level of design findings compared to guidelines but mainly in a graphical description. The highest level of design findings are described in Design-Rules and UID Patterns. In addition to the user’s basic needs and the platform, the use context is taken into account. Whereas design-rules consist of textual description only, UID-Patterns include design examples and graphical representation as well.

Design Recommendation	Reference/ Focus	Example
Norms/Principles (dialogue principles, ISO-Norm 9241-10 (1996): fundamental ideals and beliefs which influence decisions in order to reach a overall goal	User (User centered design)	Take users superior experience into account
Guidelines: suggest action in respect of a specific platform and based on fundamental principles (IBM, 2002)	User and platform, e.g. web application	Use navigation elements consistently throughout the application
Conventions/ style guide: instruct a specific use of design elements and their style (corporate design, branding) embedded in a set of guidelines and principles (Siemens, 2001)	User and platform, e.g. web application	Use the IBM logo on all pages of the IBM web site (Logo is displayed and exact location of measurements are included)
Design rules: give a concrete instruction of the design functionality. They are more detailed than principles and guidelines and are based on use context, platform and general user requirements	User, platform and use context	Locate access for main tasks in the secondary navigation. Sort them by frequency of use, the most common is at the top.
UID-Pattern: Exists of a more general part such as principles and guidelines, but also contain design rules visualized by examples and graphics	User, platform and use context	-> UID pattern „product finder“ described in 4

Table 1: Examples of design recommendations.

4 Example: UID Pattern “Product Finder”

4.1 Picture & Name

Figure 2: Product Finder.

4.2 Problem

The user wants to find products on a web shop or marketplace which match best to his individual needs. He wants advice in a sufficient not demanding attitude.

4.3 Context

E-commerce web site, B2B; target user group: expert and any user with average knowledge about technical specifications of the product. The user knows his needs and product requirements and can formulate them by technical terms and broader specifications. The user wants the quickest possibility to formulate his product requirement.

4.4 Forces

Needs are individual, multiple and formulated in different ways. On the one hand, the product finder contains many categories if it does not want to restrict the users choice. On the other hand, if there are too many possibilities to choose from, there might not be many products or even worse, not a single product will fit the user's product requirements.

4.5 Solution, Example, Design Factors

The product requirement categories are displayed in a compact, clearly arranged list without clicking through several pages. The requirement categories are most common among the target users. The input of conflicting product requirements is not possible.

At any time the product finder shows the amount of matching products.

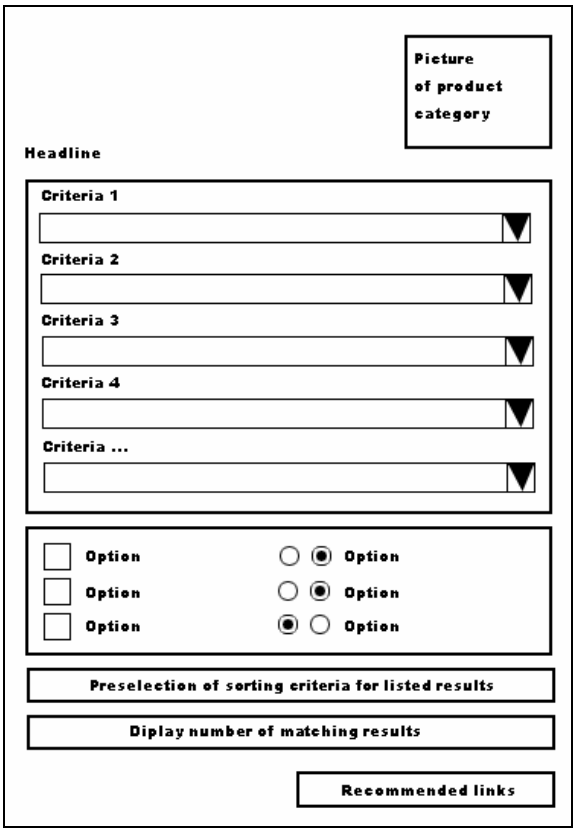

Figure 3: Abstract view.

Example: -> 4.1

- Design Factors according to example

Content: Product computer: Provide a mix out of soft search criteria such as „computer for which use", „range of price", „company", „service" and hardware specific criteria such as: processor type, clock speed, RAM, power of video card, hard drive size, form factor, operating system, network, ISDN & Modem. Give the possibility to choose ranges or write "at least" (e.g. type of processor: Pentium IV 1500-2000MHz, clock speed at least 1 Ghz)
Media: Picture of product category
Wording: -
Layout: Questionnaire, table of drop down menus and check-boxes
Functions: search function, quick access to all search criteria
Linkage: -
Task Flow: page before: homepage; next page: listed results

4.6 Rationale

Filtering supports the general practice of shopping behavior. Filter criteria are reasonable factors for the customers product selection. The system supports the user by matching filter criteria with the specification of the products. It is close to a sales assistant who suggests suitable products to meet the customer's needs, but it is less patronizing by the way product requirements can be formulated.

4.7 Validity

Focus group: 6 participants (Germany); 2 participants (USA)
Usability Inspection: 4 participants (Germany)
Usability Test: 6 participants (Germany); 5 participants (USA)

4.8 Related Patterns

Sales assistant, Configurator, Product Catalog, Direct Search, Advanced Search, Listed Results

4.9 Keywords

Way to object of interest, product advisor, consumers' requirements, product requirements, filtering, product search, quick search, advanced search

4.10 Author & Date

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5 Discussion & Conclusion

Applying usability engineering techniques such as requirement gathering patterns do not have to be collected by searching and viewing best practice examples.
Using the pattern-format accompanying throughout all phases of the product development lifecycle communication in between working groups will be optimised. Due to the iterative nature of the UID process rewriting of patterns may be necessary. UID patterns are more specific than principles and less restricting than style guides. Therefore they can be re-used at other context with similar requirements. Further research should discuss the question if creative and innovative solutions can be achieved by using UID patterns or if using solutions over and over again might lead to a lack of innovation.

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