Adaptive User Interfaces for the Clothing Retail

Karim Khakzar, Jonas George, and Rainer Blum

Hochschule Fulda – University of Applied Sciences
Marquardstrasse 35, D-36039 Fulda, Germany
khakzar@hs-fulda.de

Abstract. This paper presents the results of a research project that identifies the most important concepts for adaptive user interfaces in the context of e-commerce, such as online shops, and evaluates these concepts using a formalized method and standardized criteria. As a result, recommendations for the design of adaptive user interfaces are derived.

Keywords: Adaptive User Interfaces, Concepts, Evaluation, Retail Shops.

1 Introduction

The success of online shops is very much influenced by the quality of the user interface. Crucial criteria such as consistency and use of standards, flexibility and ease of control, transparency and robustness against maloperation, efficiency and help functionalities, clear and aesthetic design, and credibility of the shop determine whether users in the end purchase a product or not. In particular, complex products that normally require specialized service and consultancy by the sales person require a well designed user interface, in order to support the sales process. In this context, user interfaces that dynamically adapt to the needs and expectations of different customers seem to provide substantial advantages.

2 Approach

This paper presents the results of a research project that identifies the most important concepts for adaptive user interfaces [1] in the context of e-commerce, such as online shops, and evaluates these concepts using a formalized method and standardized criteria. As a result, recommendations for the design of adaptive user interfaces are derived. First user tests performed on a prototype clothing retail online shop seem to confirm these results.

3 Applied Concepts for Adaptive User Interfaces

Among the known and applied concepts for adaptive user interfaces [2], [3], that we have considered in our evaluation, are

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1. recommenders,
2. intelligent menus,
3. automatic localization,
4. adaptation of content to the users' knowledge,
5. assistant for the structuring of information,
6. intelligent help and support functionality, and
7. user-oriented optimization of navigation.

Systems that include **recommenders** dynamically propose or suggest products or content to the customer based on the knowledge that the system has collected from the customer. The user may then decide, whether he or she will make use of the recommendation.

Intelligent menus dynamically adapt to the needs of the users. E.g. a system may add or drop relevant or irrelevant items or issues to or from a menu list.

One of the most frequently used methods of **automatic localisation** is the selection of a suitable language, which of course requires information on where the user is currently located. Besides language other characteristics may also be automatically adapted based on the information on the location of the user.

Adaption of content to the user's knowledge implies that a model of the user and information on the knowledge of the user are known to the system. The system may then react according to a predefined internal algorithm or strategy.

Many applications request from the user that information is structured for further processing, storage, or presentation. An **assistant for the structuring of information** may very efficiently support this process. The benefit of this functionality depends very much on the complexity of information to be processed by the user.

A widely spread possibility to improve usability of applications is the implementation of **intelligent help and support functionality**. Depending on the history and the context additional information is provided to the user. The user shall have the possibility to configure and optimize this functionality for his needs.

The structure of content and navigation through a complex store may sometimes create problems and confusion for the user. A **user-oriented optimization of navigation** shall improve orientation of a user within the application.

For the time being this collection of concepts represents the main adaptive user interfaces, but will probably not cover all existing and future concepts. The evaluation is currently not based on user tests or questionnaires but on a formalized way of grading different aspects, which obviously seem to be important for an implementation. In future this evaluation has to be combined with practical usability tests in order to confirm the conclusions and results.

4 Evaluation of Adaptive User Interfaces

The main evaluation criteria for adaptive user interfaces that have been applied to the above concepts are

a. potential for the improvement of usability,
b. support of different modes of needs,
c. applicability to online shops, and
d. availability of user information.

The first criterion relates to the question whether the application of one or several of the adaptive concepts will **improve the usability** of the interface. The second criterion considers the fact that different users may have totally **different needs** [4]. Three different types of users have been considered, namely users that know exactly what type of product they would like to buy (pre-knowledge driven), users that have a clear idea of the functional requirements a product has to meet (function driven), and users that react in an impulsive way on certain stimuli (impulse driven). Furthermore, it has to be clarified whether the proposed concepts are in general **applicable to online shops**. Finally, many adaptive user interfaces need some **information on the user** or the user behaviour. It is therefore necessary to investigate, whether this information is available or not in an online retail context.

A formalized and more theoretical approach is proposed in order to evaluate the different concepts with an acceptable and limited effort. The validation of the recommendations shall be verified in near future using results from prototype implementations and user tests.

For each of the concepts a rating with respect to the four above-mentioned criteria is applied using normalized values between 0 and 1, where 0 indicates that the relevant criterion is not fulfilled and 1 means that the criterion is completely fulfilled. In order to improve the relevance of the results the 4 main criteria have been divided into sub-criteria. E. g., the criterion „applicability to online shops“ consists of 9 sub-criteria, representing separate, typical, functional areas, namely

- door page,
- product catalogue,
- search function,
- detailed representation of products,
- configuration of products,
- shopping cart,
- administration of customer accounts,
- payment functionality, and
- evaluation and comment functionality.

In a similar way sub-criteria for the above mentioned main criteria “potential for the improvement of usability”, “support of different modes of needs”, and “availability of user information” have been defined.

Based on these sub-criteria and the degree of fulfilment a total value has been calculated for each of the potential concepts for adaptive user interfaces (see Table 1) [5]. The corresponding main criteria are listed in Table 2.

Our evaluation results can be summarized as follows:

Table 1. Summary of evaluation results

Adaptation concept	**a**	**b**	**c**	**d**	**total**
recommenders	0,43	1	0,56	1	**2,99**
intelligent menus	0,57	0	0,44	1	**2,01**
automatic localization	0,71	1	1	1	**3,71**
adaptation of content to the users' knowledge	0,43	1	0,22	1	**2,65**
assistant for the structuring of information	0,57	0	0	1	**1,57**
intelligent help and support functionality	0,57	1	1	1	**3,57**
user-oriented optimization of navigation	0,29	1	0,22	1	**2,51**

Table 2. Criteria

a	potential for the improvement of usability
b	support of different modes of needs
c	applicability to online shops
d	availability of user information

Depending on the priorities of requirements and the relevance of the criteria Table 1 can provide an indication which of the concepts shall be followed and implemented. According to Table 1 the two concepts *automatic localization* and *intelligent help and support functionality* seem to provide the highest benefit. In particular, with respect to improvement of usability, *automatic localization* shows clear advantages. It is obvious that a user friendly interface has to consider the individual needs of the user which can be extracted from an automatic localization function. Both functions *automatic localization* and *intelligent help and support functionality* fully support the different modes of needs and are applicable to online shops. Furthermore, from a technical point of view the required user information can be made available in most environments in order to support those concepts.

On the other hand in the context of a shop application the adaptation concept of an *assistant for the structuring of information* is obviously not too relevant. Online shops typically use existing catalogues which are already well structured. However, this concept may gain importance, e.g. for complex and configurable products, which require detailed information and description. In this case, a well structured presentation of relevant product information could significantly improve usability of an application.

Clearly, for the time being, the evaluation is not based on empirical tests but on theoretical considerations and information derived from literature. Nevertheless, we believe that the results are well suited to design online shops with adaptive user interfaces.

5 Guidelines for the Development and Implementation

A set of guidelines has been derived from the results of the evaluation, which should help to introduce adaptive user interfaces in online shops.

5.1 Conformity

Customers who visit a shop expect a high degree of conformity while navigating through the shop. Adaptive concepts should never create confusion for the user. Eventually, two alternative modes may be offered to the customer, one using persistent components and the other using adaptive concepts.

5.2 Unobtrusiveness

Adaptive concepts should never disturb the sales process in an online shop. Adaptive user interfaces which are not understood by the customer may draw off the attention of the customer. Ideally, the user should not notice that the user interface has adapted to his needs.

5.3 Confidentiality

Adaptive user interfaces that make use of individual user data have to make sure that confidentiality of user data is absolutely guaranteed. If this is not the case, adaptive concepts will be counterproductive, since users will avoid these shops due to lack of credibility in the trade partner.

5.4 Controllability

Even for adaptive user interfaces the user shall keep the control over the interface. It should be possible to prevent adaptation and to fall back to the last status. It shall be avoided that users do not get access to information or details due to automatic adaptation of an interface.

5.5 Transparency

It shall always be clear for the user why and how the adaptation has been performed. This allows the user to understand the logic behind the user interface. In case of multiple and complex adaptations, additional information may be provided to improve understanding of the adaptation.

5.6 Flexibility and Scalability

The concept and architecture of the adaptive interface should allow flexible and scalable modification and extension of an adaptive user interface. It may be necessary to

optimize the functionality of the interface in a continuous process, e.g. different languages may be implemented at a later point in time in order to adopt to new markets and users.

6 Conclusions

The conclusions that can be derived from this evaluation of adaptive user interfaces can be summarized as follows.

- Most of the listed concepts are suitable for the **improvement of usability**. However, adaptive menus and navigation structures are critical, because users might miss consistency and controllability.
- All concepts except intelligent menus seem to offer benefits for the **support of different modes of needs**.
- In principle, all concepts except assistants for structuring information are **applicable to online shops**. However, the effectiveness very much depends on the concrete application.

Availability of user information should be given for all the presented concepts. Relevant user information can be collected in a typical web application. Additional information on the location of users can be derived from the user's system or connection, respectively.

We are currently undertaking practical user tests in order to receive confirmation for the above evaluation results, guidelines and conclusions.

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