User Interfaces for an In-store Sales Process Supporting System

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This paper considers the application of computer-based technologies in retail settings and describes the development of a system designed to support the in-store interaction between customer and sales person. The particular application context is that of a made-to-measure shirt shop. A sustained program of research has led to the development of a system that facilitates the selection of shirt components (e.g., fabrics, collars, cuffs) and allows customers to see a virtual representation of a shirt prior to purchase. An iterative and participatory design process has been adopted, and many interface alternatives considered. Results of this work from a usability point of view are presented and implications considered. Advantages for the customers, sales personnel, and shop owners can be identified. However, integration of 'usable' computer technology in this complex 'real world' setting needs to be improved and further issues remain to be resolved.

I. Introduction

Information technology is pervasive in today's work and home environments. It is difficult to imagine daily life without computers. The retail trade has been at the forefront of much of this development, with e-commerce becoming an increasingly important retail method. According to TNS Infratest, analysts expect West-European e-commerce turnover to rise up to approximately 2.4 billion Euros in 2007, which is three times more than generated in 2004 [1].

There are many desirable features of e-commerce. For example, it provides consumers with access to a wide variety of product alternatives and makes economies of scale possible. However, e-commerce cannot service all consumer needs. For example, social aspects of the shopping experience are not easily substituted within such systems. Related to this, e-commerce does not provide consumers with the immediate support of a sales assistant, nor does it provide access to real world products for appraisal. These latter factors may be particularly important to consumers when selecting certain types of products, e.g., those for which physical characteristics are key (such as fabrics), expensive products, and/or non-standard or customizable products. Moreover, consumers vary in their familiarity with and access to computer technology. Some groups in society will be less likely to use e-commerce and more likely to prefer, or to rely on, 'real world' shopping.

Given these potential advantages of 'real world' shopping, it is valuable to consider means by which the complex real world sales process can be supported by virtual technology (see e.g. [2]). In this context, computer-based support might take several forms, including decision support [3], [4] and product illustration [5]. However, as with other settings in which there is a similar interplay between user, advisor, real objects/environment, and virtual objects/environment (e.g., augmented reality systems in museums [6]), delivery of a usable system is not a trivial task.

In this paper we present an overview of a sustained program of research that has focused on the development of an in-store sales support system. The particular sales context is made-to-measure shirts. The goal of this system is to support the interaction between sales person and customer – not to replace the sales assistant. It should facilitate the selection and comparison of product alternatives. When shopping for a made-to-measure shirt the customer would typically compose a desired shirt from a large array of fabrics, cuff designs, etc. To support this, examples of fabrics, product components (e.g., pockets or collars), and some made-up shirts are likely to be available to the customer. However, customers are usually not able to see a shirt made to their full specifications prior to purchase and production. Especially new customers often have difficulties imagining what the shirt would finally look like and thus deciding which options to choose.

Computer-based technology has the potential to support the selection process, improving access to the large database of design alternatives. In addition, virtual representations of product alternatives would obviously be helpful, and this has been one of the primary goals of this research work. This would enable the customer to get a clearer understanding of what the selected combination of shirt design features would look like when the shirt is completed.

Usability is essential for the success of any interactive system and, thus, is another major goal of this work. Our results in this field are reported hereafter.

Work started with the ShopLab project, 'The Network for Test and Design of Hybrid Shop Environments based on multi-modal Interface Technology' [7] in November 2001 and was seamlessly continued with IntExMa, the 'Interactive Expert System for Made-To-Measure Clothing' [8] in Octo-

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ber 2004 which is still underway. ShopLab aimed to develop hybrid multimodal systems for traditional city-centre shops that would be applicable within a wide variety of shops and different cultural contexts throughout Europe. It was important that the solutions were customisable to enable support and enhancement of the distinguishing characteristics of individual shops. In contrast, IntExMa focuses on the improvement and optimization of the previously mentioned solution for a made-to-measure shop, which arose during ShopLab.

In the following sections of this paper, first our methodical approach is described followed by a description of the basic system concept. Subsequently, a historical account of the developmental process is provided, broken down into three sections, each including a system description, details of user testing, results of testing, design decisions, and implications for the following design iteration. Finally, conclusions are drawn and future directions considered.

II. Methodological framework

We implemented a User-Centred Design (UCD) process that incorporated the following steps: i) analysis of context of use; ii) requirements specification; iii) production of design solutions; iv) evaluation of design results with (both) end-user groups; and, v) feedback into the next design cycle [9]. In total, three iterations were completed, during which different interface alternatives were considered, implemented as rapid prototypes and tested in the project laboratories with the most promising finding their way into the superordinated system. Test participants were always matched to the demographic profile of shirt shop customers and sales staff. Tests with physically handicapped people that have to use a wheelchair were also carried out, as this group of consumers has particular difficulties in many traditional shopping environments.

During regular evaluation phases the complete system was subject of extended usability and acceptance tests, conducted with real customers and sales staff in one of the shops of the made-to-measure tailor Campe & Ohff in Berlin or Hamburg. In this way, usability data were gathered in the same environment as the final product would be used in.

The tests always included quantitative and qualitative parts: Formal task-based tests were carried out along with informal observations and discussions with users. The formal tests consisted of a series of tasks designed to represent key components of the system functionality followed by a short questionnaire. In all cases the objective of the tests was to gain detailed feedback about the usability of the system for each of the main system features and functions.

III. Overall system concept

The context of use analysis was designed to provide a comprehensive understanding of the characteristics of the users, tasks, and the organisational and physical environment. From this a precise specification of the initial system requirements was generated, that took into account a usability perspective. Two user groups were differentiated: customers and sales staff. For the latter, basic IT experience can be expected, and some training on the developed system will be possible. When considering the customers a wide range of characteristic values (age, abilities, prior knowledge, physical handicaps) had to be assumed. This required taking into account the lowest common denominator of user skills for the system design.

General patterns of activity in sales/shopping behaviour were identified and analysed: Individuals engage in a process of collaborative consultation, with sales staff acting as experts to identify customers' requirements, and to guide them through the process of selecting an appropriate product. A large part of this process can be described as a complex decision-making sequence. An initial break down of the product range into groups of items of interest is followed by a detailed consideration of identified suitable options. These are considered in greater detail, as the customer gradually focuses on a single item of interest.

Designed as an in-store, stand-alone installation, the system incorporates all the hardware and software necessary for its operation. From the user perspective, a large-scale, vertically mounted display screen (minimum 40 inches screen size) forms the centre. Its purpose is to display the virtual 'try-on', which represents one of the central ideas behind the system: It allows the customer to see themselves, or at least a virtual representation of their body, dressed in the desired made-to-measure shirt, also as a virtual representation. This set-up follows the metaphor of a 'virtual mirror'.

During the course of this research, two different approaches were considered to accomplish the desired effect. The first utilised augmented reality technologies, the second virtual reality (see next sections). To enable the customer and the sales staff to interact with the virtual scene, e.g. see the shirt from different angles or from behind or zoom into details, a range of special interaction techniques, devices and user interface concepts were researched.

The idea of using a 'virtual mirror' for the sales of made-to-measure clothing and clothing in general is not brand-new. Several projects and companies have already worked on its implementation or the solution of related sub problems. The approaches taken differ a lot and have varying levels of complexity, see e.g. [10] for a very sophisticated solution and [11] for a less complex web-based solution. The innovative aspects of the research reported here results from the system's direct integration into the sales process and the consideration of the added-value to small and middle sized retailers and their customers. Thus, innovative, technically high-grade, but affordable solutions were the focus of the project.

The second functional area of the system, closely related to the virtual 'try-on', is the product selection element (choosing from the range of product components offered by the shop) with a large database of selectable design alternatives, customer data management (e.g. name and address, body measurements, delivery modalities, product favourites and sales history) and electronic sales features (e.g. shopping cart).

The functional domains of 3D interaction and business process support were not considered as isolated with well-separated interfaces. Instead, the aspiration is to integrate both in an effective way.