Interactive Marketing and Intelligent 3D-Configuration of Products in Electronic Shop Systems

Ioannis Fikouras, Stephan Wurst, Frithjof Weber

BIBA, Hochschulring 20, D-28359 Bremen, Germany, Tel.: +49-421-2185575, Fax: +49-421-2185551
fks@biba.uni-bremen.de

Kai-Oliver Detken, Uwe Kaufmann

WWL Internet GmbH, Goebelstr. 46, D-28865 Lilienthal/Bremen, Germany

Abstract

During the last years, marketing of products via the Internet became more and more important for both customers and manufacturers. Today, electronic shop systems enable people to select products from catalogues, gather further information and finally order and pay the articles via a WWW browser. However, most products sold this way are fixed and cannot be customised to satisfy the buyer's requirements.

The objectives of the European project INTELLECT are to enable the suitable representation of such products including all practicable variants in electronic commerce systems to achieve the most realistic possible visualisation. New concepts of configuration using 3D user interfaces will enable potential customers to design a product customised to their individual needs and wishes.

This paper will present the first results of the project which has started in the beginning of 2000. User requirements' analysis has already been carried out by interviewing the end-users in the consortium. Based on these results, the system concept is currently being developed. The paper will close with a description of the envisaged results and a description of the upcoming tasks.

1 Introduction

This paper aims to contribute to a new type of trade in the business sector of trading and shopping in Europe. Based on the research project INTELLECT it describes an electronic shop system is developed including an online configuration module for products which will be represented by 3D / virtual reality techniques as well as advanced user assistance and advice to improve the business opportunities for European service providers and consultants as well as for manufacturers, wholesalers, sellers, and consumers.

INTELLECT objectives are to enable the suitable representation of products including all practicable variants in electronic commerce systems to achieve the most realistic possible visualisation. Industrial target groups are bicycle manufacturers, suppliers, and wholesalers, distributors of computer equipment and networking products and in addition average customers. The conception of the system will be as generalised as possible to facilitate the transfer to other industrial sectors.

The use of the INTELLECT system will support the close co-operation of companies and customers inside of the European production, supply and trade chain to strengthen the enterprises involved in the European market against the world-wide acting non-European competitors.

As a result of the project's activities, by the end of the project, the e-commerce system prototype developed will be ready for commercialisation and the end users involved in tests and demonstrations will be able to use the system for their core business, then extended to the Internet.

The overall INTELLECT result will be an electronic commerce system for products which can be configured on-line in virtual reality. Company's back-offices, security and privacy demands, a configuration module incl. management of variant dependencies, and an interactive multimedia assistance module will be integrated. Milestones are the establishment of a user group, the specification and implementation of the system, the conclusion of the pilots, and two international workshops for dissemination.

2 State of the Art

2.1 Configuration

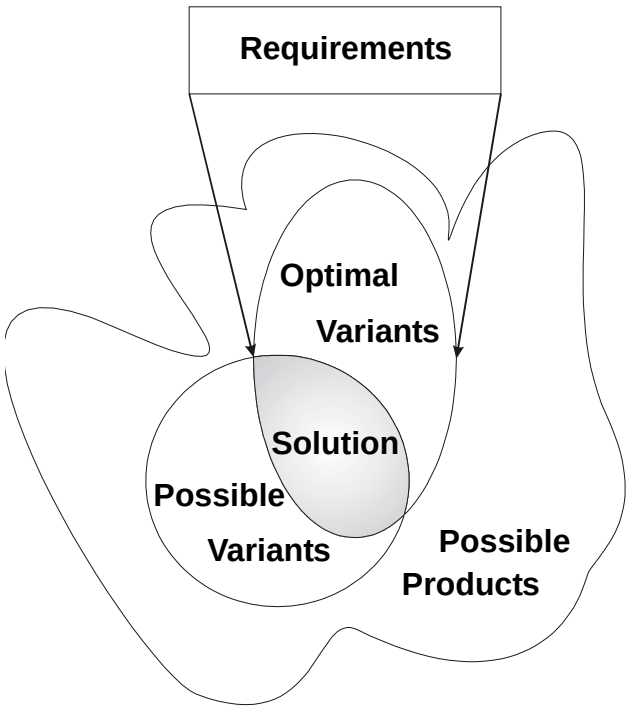

Figure 1: Variant configuration

Configuration is the process of composing complex products out of components. A configurator is an expert-system that supports this process and thereby uses predefined goals as well as expert knowledge. Design goals can be i.e. constraints, functional requirements, predetermined components or various quality criteria [1]. Such systems do not follow a single predefined method, but rather a strategy based on a series of small steps. Each step representing a certain aspect or assumption leading to the configuration of the product.

Configuration is therefore considered as the solution to a single exercise and not the solution to a whole problem or problem class that has to be first methodically analysed [3]. This implies the following:

- The set of all possible solutions is finite.
- The solution sought after is not innovative, but rather a subset of the available parts.
- The configuration problem is known and well defined.

Configuration functionality is nowadays normally a part of large software packages meant to support the production process. Such software known as ERP (Enterprise Resource Planning), PDM (Product Data Modelling) or DPM (Decentralised Production Management) normally contains extensive knowledge based configurators that are integrated in the design and production process. Popular eShops or other similar Internet or Web related technologies do not possess any comparable functionality.

2.2 Virtual Reality

Virtual Reality (VR) is rapidly leaving the realm of experimental science and is becoming an increasingly popular concept. Even though the level of resources currently needed for a sufficient immersion level is still forbidding for the average consumer, the popularity

of said technology is growing. It is conceivable that, in the near future everybody will have at home a private VR system which will allow him to completely immerse himself in a virtual universe [3].

Immersion in a custom VR universe typically involves 3D model technology created with the help of 3D modelling tools. Such tools often depend on graphical material based on an existing setting. VR is achieved using a dynamic and interactive simulation of a limited space based on 3D graphical representation. The realism of this simulation depends heavily on the quality and responsiveness of the graphical material and technology involved.

Other existing techniques like a stereoscopic vision system can increase the quality of the immersion. Even better results can be achieved through the use of motion capture, force feedback and tactile sensation technologies.

Full sensory VR immersion based on the aforementioned techniques can not be achieved in the scope of an eShop because it would require resources not available to the average consumer. Internet VR on the other hand is based on interactive 3D worlds that can be viewed and navigated through a normal browser. Such technology can make navigating a site more entertaining for the consumer and help showcase the products offered more attractively and ultimately more effectively.

2.3 Online User Assistance

The goal of the Online User Assistance to be offered through INTELLECT is improving the online shopping experience by emulating aspects of a real shop pertaining to situations where the customer is in need of consulting and product information in general. Community services (like conferencing systems, news systems, etc.) that help create and support the customer community by offering the functionality needed for communication on product issues also helps achieve this goal.

The second goal addressed by the Online User Assistance is after-sales support. The customer must be able to get effective and immediate help on any problems he might encounter with a product he purchased.

A study by Forrester Research [4] indicates that 66% of all on-line shoppers during last year's holiday shopping season abandoned their shopping carts before checkout.

Reasons for this could be:

- Customer is not comfortable dealing with an eShop lacking human interaction.
- Customer can not find the product he is looking for.
- Customer has problems in configuring the product.
- Product quality is not demonstrated in a plausible way.
- Customer just wanted to take a look at the price of the specific configuration.

These issues clearly demonstrate the need for further development in the area of pre-sales and after-sales service. Both functions belong to the area of Help Desk/CRM (customer relationship management) tools, one of the fastest growing markets last year.

2.4 Electronic Shop Systems

Most of the currently available eShop solutions are only of limited flexibility and therefore of little use when facing special requirements such as variant configuration or 3D visualisation of the product at hand. The fact that such products also lack adaptability only makes the problem more acute.

The eShops evaluated [3] share a number of common properties. The aesthetics of the site it self always depends on and reflects the product sold. Not every product which is configurable has to be shown in 3D. On the other hand sites selling products for which 3D and VR would be helpful or attractive seldom make use of such techniques. Most of the shops also lack user friendly helpdesk systems. Catalogues sometimes lack elementary features

like search functions. Interaction with the site is very limited. Consumer profiling and community building are only rarely supported. Product information is scarce and hard to find. The use of standards is normally restricted to techniques for traditional payment and secure communication, Internet payment systems are non existent.

To put it in a nutshell, most eShops lack basic functions like search engines, personal favourite lists, bookmarks or different payment methods. User friendly features like online assistance, multimedia representation and 3D configuration are very rare or non existent.

3 User Requirements

3.1 B2B partnerships

SMEs targeted by INTELLECT typically rely on an extensive network of partners such as retailers or distributors in order for them to bring their product to the end-user. These partners offer a diverse amount of services to the consumer including pre- and after-sales support, warranty services, delivery, etc. Competing against such partners is clearly against the best interest of most SMEs as they are generally not in a position to offer comparable services on a broad basis, because of the considerable investments involved with the construction and maintenance of such a large scale support infrastructure. eCommerce presents a separate sales venue aimed at consumers that are not being attended to by any local business partner. These could be customers living in regions or countries where no such stores currently exist (i.e. new markets or isolated areas) or customers in need of very specific products, configurations or services that can not be delivered by the local dealers.

INTELLECT as a world wide accessible information centre could enable the producer and its business partners to more effectively sell the product in question by providing consumer support in the form of state of the art 3D configuration, interactive multimedia helpdesk, community building services, multimedia product information etc.

3.2 Product types

The products offered by the INTELLECT end-users have different characteristics thus requiring different sales strategies. Most of the products are highly configurable, some of them even require for the consumer to possess special skills in order to integrate them in existing configurations. This characteristic has a number of consequences depending on the development cycle for new products, the nature of the components or products and the marketing strategies of the specific firm. Nevertheless all of the end-users could greatly profit in different ways from a configuration process simplified through intelligent software and visual representation of the data. Functionality of this nature would even enable less experienced consumers to produce their own configurations or individualised variations based on existing models.

High end bikes are individual configurations and cost well over 4000 €. This limits the customer group to very involved hobbyists or professionals. Push-type scooters on the other hand attend to no practical need, they are a highly life-style oriented product. Their configuration is simpler but the overall presentation sets rather high aesthetic standards. Personal computers as a product do not really require any visualisation even though they might profit from an attractive presentation. However, configuration as such offers the customer the possibility to create a product on his own without running into trouble because of an inconsistent specification.

3.3 Added Value

The 3D configuration support integrated in INTELLECT aims to deliver added value through innovation. This feature is meant to both assist salespersons in a retail store in producing and ordering correct individual configurations according to the customers wishes, but also to allow for private customers to experiment in a user friendly fashion with new

variants on their own. This feature reduces the requirements on the salespeople on one hand, and at the same time involves the consumer personally giving him the feeling that he is ordering something individual and special.

Configuration should always be based on an existing model in order to make it easier for the consumer. The basis for the 3D representation should be a 3D wire frame model that represents an idealised form of the product. The software should be able to freely rotate and move this model in 3D space. The user should then have the possibility to add or change various components to this wire frame thereby "filling" it piece by piece. The categorisation of components in groups (i.e. Compulsory, Useful but optional, Luxury) according to their importance would also support less experienced buyers. Component models should be low detail 3D models of the actual components or of other components with a similar function. It is not required that every make of every component have its own detailed 3D model. This process should ultimately lead to the creation of an individual configuration.

The system should offer a great variety of configuration criteria ranging from "hard" factors like price, size, weight, performance criteria, etc. to "soft" factors like a certain image, popularity, etc. Configuration based on non-technical criteria would be a service to consumers interested in an individually configured product, but lacking the technical knowledge to assemble the configuration on their own. The system should i.e. be capable of configuring computer systems that are explicitly using the most "trendy" components or are primarily suitable i.e. for playing games or running scientific simulations, etc.. Other criteria i.e. like the system with the fastest CPU under a certain budget or the best possible system built around a specific graphics card would also be interesting.

The eShop could also offer a great deal of information as added value in order to offer better pre- and after-sales support as well as promote the image and lifestyle the company wants to associate with their product. Such information would be technical data (data sheets, case studies, reviews, etc.), usage tips and tricks (new applications, performance tuning, etc.), supporting software (drivers, demos, screensavers, etc.), multimedia features (animations, music, art, etc.) and much more depending on the actual product.

Customer loyalty and brand recognition should also be supported by INTELLECT through the implementation of community services based on standard CSC/W (Computer Supported Co-operation/Work) tools. These services would aim to create and support an on-line community based on a clear preference for the company's products that communicates through conferencing systems (video and text), voting ballots (customer surveys), online events (interviews with product gurus), etc.. Such communities form the basis for many modern services offered by customers to other customers.

Other features the companies would like to offer through INTELLECT are a configuration Hit-List containing the most popular model variants. Statistical analysis of the orders to harvest the innovative ideas and potential coming from the customers would produce more desirable products and anticipate future trends. Statistics on which models (even new customer made individual configurations) sell best could be used as a basis for the development of products better suited to the customer bases thus increasing demand.

4. Business and system concept

4.1 INTELLECT Business Model

Back office system actors in the following diagrams represent the back office systems of the SMEs. The configuration system actor represents the central INTELLECT Configurator supporting the eShop.

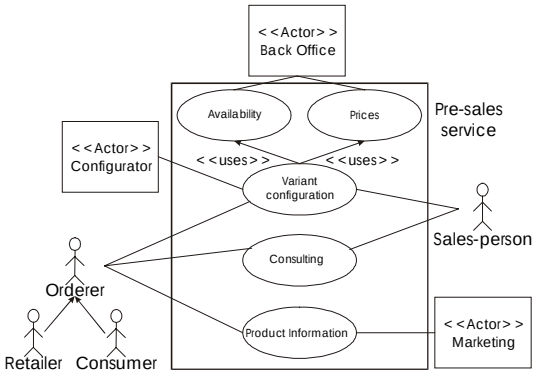

Figure 2: Overall Intellect Business Model

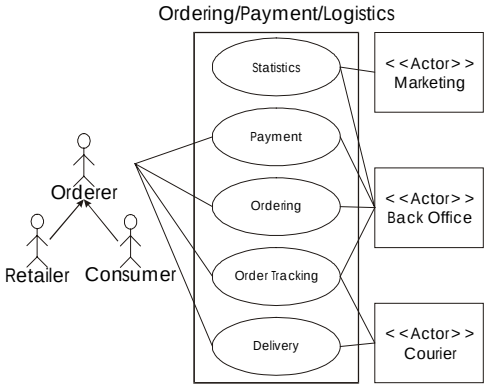

Figure 3: Ordering Process

In figure 2 the role of the salesperson is played by personnel from local retail partners of the INTELLECT partners. The marketing system actor in figure 3 represents the marketing departments of the various partners that are generally responsible for determining the product line and could profit from customer feedback provided by statistical analysis of the sales data. The courier actor represents the logistics company hired to deliver the product to the consumer.

4.2 Intellect System Concept

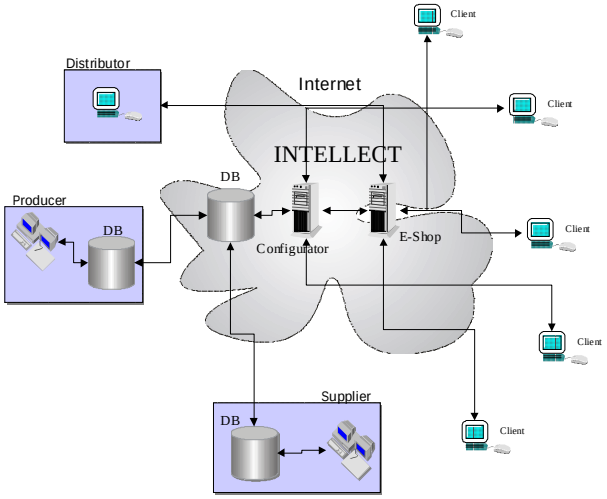

Figure 5: System Architecture

The system to be developed by the INTELLECT project is composed of several modules which are shown in the following figure. The main Intranet modules consist of the existing database (management system) for the order processing module and electronic shopping. This database contains all product and order related information. It will be populated and updated using information already available in the supplier systems. This information will be updated on-line using standards for the exchange of product data (e.g. STEP). In addition a second database is filled with multimedia representations (volumes models, sounds, videos, textures, etc.) as well as all rules of their interdependencies concerning the technical construction and representation of the company's product line. The configuration module supports creation and population of this second database.

Further – next to the electronic shop module – the presentation module is intended as the main module for online interaction with the customer. This module offers:

- individual configuration of the viewed objects,
- textual and audio visual explanations,

- tips for the customer concerning his selections, things that fit well together in terms of technical properties, style and design,
- strength and weakness of the product when fitted with optional features and more.

All presentation on the screen of the customer's computer will be realised with newest multimedia technologies. Virtual reality (VRML) will be used to demonstrate e. g. the fit of the accessories selected to the virtual image of the main product.

In case of unanswered questions the customer has the possibility to call the company's hot line or call centre with the application via the Internet. Technologies to be used are internet telephony with screen sharing and / or video conferencing.

The electronic shop module takes the order of the customer over a secure connection via the Internet. At this time a human employee could carry out a spot check of the order to attest the customer the correctness of the order. An acknowledgement with complete details of the order will be returned automatically to the customer.

5 Conclusions

Capturing the user requirements, The Intellect projects collected valuable information about both the sellers and the buyers of configurable products. Interviews and questionnaires proved an increasing need for customer support in the area of product configuration and ordering. Even products that do not seem suited to 3D visualisation, like personal computers, will definitely profit from this innovative approach. User requirements analysis also showed that customers need individual support and personal contact raising the need to offer a comprehensive help desk system.

Currently, the INTELLECT system architecture is being defined, taking into account also aspects discussed with the end-users. The next step will be the implementation of a first prototype that will then be evaluated by project end-users as well as by potential customers. Results of this preliminary software will lead to the final prototype that will be installed at the end-users' sites. Testing the system in real-life business (first as a simulation but later for authentic business cases) will lead to the final INTELLECT system that will be marketed after the end of the project.

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