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PRODUCT INFORMATION BACKFLOW USING MOBILE AND INTERNET-RELATED APPLICATIONS

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Abstract

Information gained from purchasing decisions and product utilization lead to important perceptions for product development and product marketing. The following project proposals concern the utilization of methods for product and user analyses using electronic support of the end consumer with mobile and internet-based applications as well as the reintegration of results into the company of the product manufacturer.

Keywords: Product information backflow, mobile, internet, ecological product features, customer

1. Introduction

The project proposals of this contribution are based on the intent to provide the end consumer with an understanding of the ecological product features of daily-use products, to provide the purchasing decision with information and additionally with ecological product features, to support the utilization phase with information and to gain information for product development and marketing in the purchasing decision and utilization phases.

As regards content, the basis for the project proposals is formed by the CRC392 (Collaborative Research Center) in the area 'Design for Environment – Methods and Tools' of the Technical University of Darmstadt. This research project started in 1996 and will end in 2004. It was funded by the DFG – Deutsche Forschungsgesellschaft, Bonn, and the state of Hessia, Germany. In a subsequent transfer project, the results acquired will be implemented, presumably in cooperation with industrial enterprises, software manufacturers and information service providers. The industrial enterprises are mainly associated with the household appliance area.

The transfer project provides the framework for the project proposals presented in this contribution. They will come into existence as transfer projects between the departments product development and psychology of the CRC392, the industrial enterprises and the company GPA, which acts as an information platform. The GPA information platform will provide essential information for the purchasing decision and utilization phase of the end consumer and will generate information for re-engineering in product development.

2. Design of Projects

Since 1996, the CRC392 "Development of environmentally sound products" has been developing and studying different methods, tools and instruments that can support the product developer in his daily work of developing sustainable products.

In order to study the consumer effectiveness of already discovered product-related, ecological, economical and technical product features from the requirements of the product pre-development, the product development and the product marketing, methods from psychology were developed and applied during the purchase and the utilization of the product.

These results shall provide information on buyer behavior and usage behavior concerning the choice of ecological product features and the consumer's ecological awareness. These results can be used to derive requirements for ecologically, economically and technically oriented product features for the product pre-development, the product development and the product marketing.

Previously, these studies were conducted using individual interviews at the point of sale or in the laboratory. Looking at the diversity of devices of the household appliance industry that are in focus, it becomes clear that the expenditures required for acquiring user information via interviews on the variety of different appliances are extremely high. Those industrial enterprises that today are, and in future will be, very interested in information returns on product selection and usage behavior, fear the costs for such time-consuming studies regarding the diversity of their products.

A remedy for this could be low-priced, standardized procedures based on scientific methods that enable to informatively support the consumer during the purchase of a product and to accompany the consumer and provide information during the entire utilization phase of the product up to the end-of-life of the product, the recycling phase. This objective can be achieved by utilizing the internet and mobile handheld devices as well as by combining and applying different methods from the humanities and engineering sciences. These scientific methods, tools and instruments have been partly developed in the CRC392.

The company GPA – GLOBAL POSITION ADDRESS from Darmstadt has developed a database and a patented procedure, which, in cooperation with the departments of the CRC392, in particular with the departments psychology and product development, aims at fulfilling the above-mentioned objective. GPA is a company that combines "searching and finding" of information from the virtual and from the real world. By using the cellular phone network standard UMTS in connection with GPS, Global Positioning System, the pedestrian as well as the car driver can "search and find" products during shopping with an accuracy of centimeters.

GPA's tasks in the transfer project will be to informatively support the pre-sales phase of end consumers and to guide them to the actual product using navigation techniques. This means that product information, together with the corresponding data on access to the point of sale, are stored in GPA's database.

The products are described using ecological, economical and technical product features and their characteristics, which can be automatically "searched and found" by the consumer using a personalized search procedure. The search for products using individually compiled product features and characteristics that are evaluated by the consumer in advance can be entered into a shopping list. With this shopping list, the consumer can let GPA guide him, using distance-time and/or cost-optimization while maintaining the consumer's individual quality requirements, to the respective POS, points-of-sale, and view the product on site. The

informational support of his product selection can be provided from simple to detailed, depending on his preferences. After the product has been purchased, the consumer can be questioned via mobile device or internet. This information can then be evaluated using the available scientific methods and, together with statistical data, can be made available to the product manufacturers for reintegration into development and marketing.

A further possibility of supporting the customer begins in the after-sales phase or the utilization phase. In the utilization phase, the consumer or customer can be questioned about the utilization of the device and its operation time via internet or mobile device. GPA provides information on finding accessories, spare parts, service, device tips and recycling both in the internet as well as in the real world. The studies on usage behavior can be supplemented by the consumer connecting the device to his PC or his mobile device and thus transmitting the data to GPA. For this, a factory-installed interface and electronics would be required.

The information gained is processed for the product development and the product marketing using the existing methods. Statistical data is processed in GPA's own database and can be downloaded by the product manufacturer.

For legal reasons, the questioning of consumers during the purchasing and utilization phases will only be carried out with the written permission of the user/purchaser.

With an appropriate elaborateness of the software in the internet and in the cellular phone network resp. mobile radio network, it should be possible to carry out an automated evaluation of the subprojects that are proposed in the following. The person using the results should be able to interpret the respective results. For this, a result utilization level needs to be realized that offers the corresponding possibilities and is not too abstract nor too highly aggregated, so that the basis of the results and the evaluation method remain apparent.

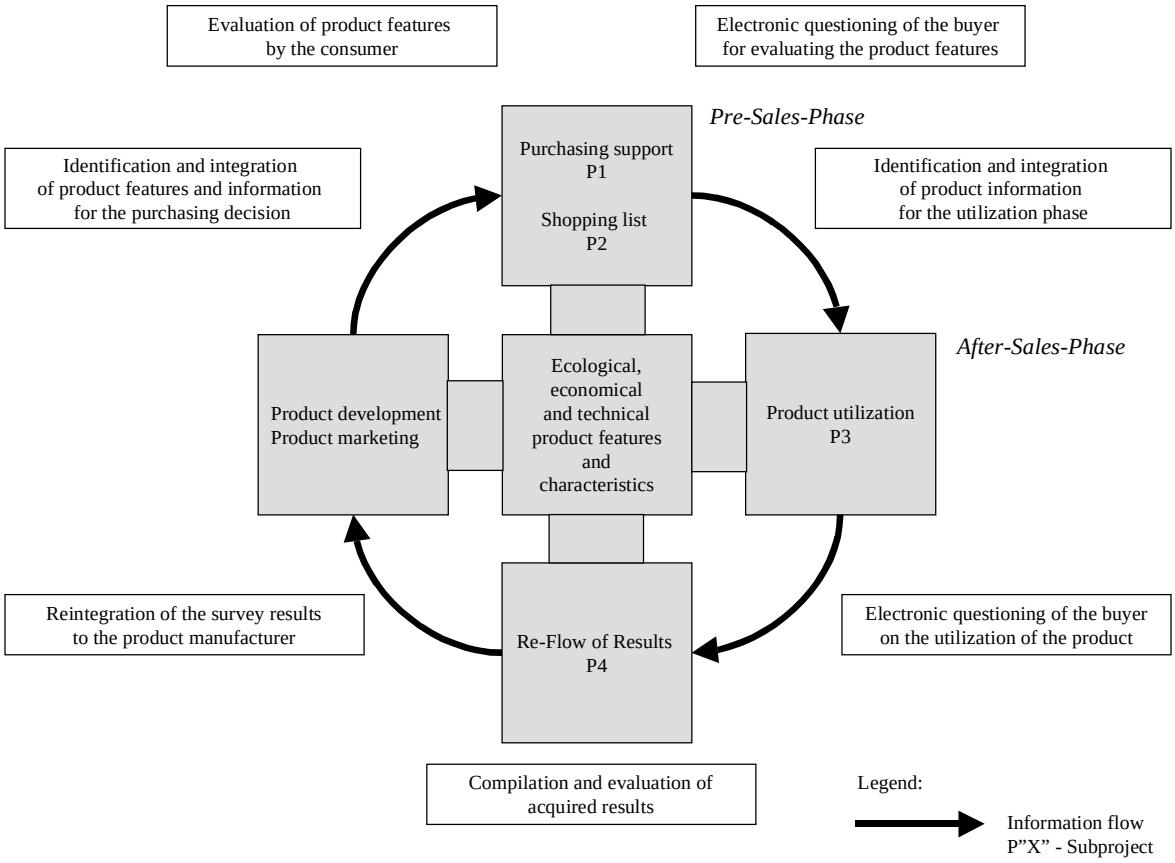

Figure 1: Overview of project proposals – product features at the center of decision-making

2.1. Subproject P1 - Purchasing Support

In order to convert product features from the product requirements of product development and product marketing into purchase-supporting product features and feature characteristics, methods should be used which, for a defined product group, e.g. household appliances, enable to question potential buyers on corresponding product features respectively use them as an evaluation basis for the purchasing decision.

Surveys of this kind were carried out in the CRC392 within the scope of market-psychological studies. These studies dealt with standardized surveys, simulated purchasing behavior and purchasing decisions concerning the product "vacuum cleaner".

Market-psychological studies [1, page 325 et sqq, A8] found that the most frequent purchasing criteria were design/color, the price, the brand, the power consumption, functionality/accessories and the performance. By considering the three features that were mentioned first as the most important ones, the following order was arrived at: price, brand, power consumption, design/color and functionality/accessories.

However, a survey on simulated purchasing decisions conducted immediately after the selection using a questionnaire classified quality criteria (quality, robustness, longevity) and easily acquirable spare parts as the most important criteria and were evaluated as being more decision-relevant than the price. Design was ranked on a medium position and performance on a low position.

Among the 22 subjects, mainly students, 15 decided for the vacuum cleaner "Green Energy" and 7 for the vacuum cleaner "Super C". After additional ecological information was provided, the ratio changed to 19 : 3 in favor of the "Green Energy".

One possible practice-oriented consequence of the perceptions on product information is to provide eye-catching reminders concerning the operating instructions on the packaging. A further alternative could be the placing of information on environmentally sound behavior directly on the device or on the packaging. For this, the most effective requests still have to be developed and tested.

The approach of the project proposal for purchasing support concerning the support of the customer with product information and/or additional ecological information can be found in these results.

GPA will provide product information in order to support the consumer on-site during shopping via cellular phone resp. mobile radio devices and/or internet.

It is important that the results from the identification of the product features can be depicted and utilized electronically for consumer support. Furthermore, it should be considered that one or more feature description levels have to be defined, which must be not too detailed nor too simple and superficial. The value of the statements has to be effectively maintained for the return to the product manufacturer and must not be too imprecise, as this would render it objectively unusable.

The integration of the identified relevant product features into the selection, evaluation and information support is carried out through GPA's own database. As a first orientation for a project proposal, two to three different levels of detail, which in practice can then be selected by the customer, could be sufficient. The customer could, depending on the selected level of detail, be compensated for his time expenditure using a bonus points system. The differentiated selection for this shall be made possible by the surveys and evaluations of the psychology department. Later on, this procedure should be extended to such an extent that the software can almost automatically convert the product requirements of the manufacturer to buyer-related product features. An integration of market-dependent trends, product, buyer and manufacturer-related, into the survey system could also be highly interesting.

GPA will develop and provide software tools for individual product evaluation. The survey in its final version shall be usable via internet and cellular phone network resp. mobile radio network.

2.2. Subproject P2 - Shopping List

The end consumer can compile his individual product shopping list using the GPA platform in order to receive a cost or distance-time optimized route on the day of his shopping trip. Before this, the customer can use his individual product evaluation tools. At this stage, it is interesting to find out to which product features and feature characteristics the customer attaches "importance" to. These are to be queried and then evaluated in subproject P4. As a suitable addition to product selection, it could be conceivable that, in the pre-sales-phase, the customer obtains decision-supporting information using evaluation instruments such as LCAD [2] in order to confirm his purchasing decision. For this, for example the LCAD-specific features and characteristics for the purchasing decision system would have to be queried concerning the buyer and be integrated into the purchasing support system. LCAD (Life Cycle Assessment by Computer Aided Design) is a fuzzy-based product evaluation system that returns ecological evaluations on components, modules and products during product development and construction. LCAD in connection with a CAD system has already

been developed as a subordinate objective of the CRC392. GPA will develop software methods that will enable the end consumer to individually adjust and evaluate the product features and their characteristics. The differentiated quality rating for this shall be made possible by the surveys and evaluations of the psychology department in subproject P1.

2.3. Subproject P3 - Product Utilization

Results from the user studies [1, page 684 et sqq, B6], carried out by the psychology department of the CRC392, showed that user behavior is characterized by many habitual actions. Many users are hardly conscious of the awkwardness of their actions. Even in video-based questioning, they find it hard to challenge their actions and to develop more efficient behavior. In order to achieve environmentally sound behavior, it therefore seems necessary to restrict freedoms and to regulate behavior using automation functions. However, the automation may be achieved in different gradations. The selection of the suitable degree of automation depends both on the product and on the personality. Studies on automation coupled with product and personality interaction are still to be carried out.

Furthermore, guidelines and directives have to be implemented, with whose help the acquired data can be processed, depicted and transmitted in a way that is comprehensible for the designer.

Comprehensibility is only one important aspect that needs to be considered when designing information in a user-oriented way. It is of equal importance to ensure that the information catches the user's attention and influences his behavior. As conventional information in the form of operating instructions have proved to be of low effectiveness, it should be especially studied in how far alternative presentations, e.g. in the form of stickers or electronic displays, improve the effectiveness of information-based measures for influencing the user.

In the transfer project, these deficits shall be taken up as approaches for creating an information platform for use, in ecological regard, too.

The use of a method for studying the usage behavior of the buyer concerning the purchased product would be interesting for the electronic information support and questioning. Such a method will be used for surveying the customer about product features, product functions, operation time as well as on how he handles the purchased product. Additionally, based on his statements, the customer can receive information on locating accessories, spare parts, service, device tips and recycling.

The studies on usage behavior can be supplemented by the consumer connecting the device to his PC or his mobile device and thus transmitting the data to GPA. For this, a factory-installed interface and electronics would be required. This would also make it possible to request the usage parameters via cellular phone network, WLAN or Bluetooth.

2.4. Subproject P4 - Re-Flow of Results

Product manufacturers want to integrate results from the studies in new or changed products. In this subproject, the results from the three described projects will be compiled and evaluated. For this project, the priority has to be large benefits for the product development and the product marketing of the manufacturer.

In order to reintegrate the results, the information that is gained is processed for the product development and the product marketing using evaluation methods. Statistical data will be processed in GPA's own database and can be downloaded by the product manufacturer. Additionally, the results gained from project 1 and 2 on product features and characteristics in the individual shopping list can be used for the analysis. Here, it is conceivable to perform an

analysis of a changed quality rating of the product features and characteristics during and after the utilization phase and the intent to select the same device or the same manufacturer again. The utilization phase survey in its final form will be usable via internet and cellular phone network resp. mobile radio network.

Results of the CRC392 on user studies [1, page 239 et sqq, A5] in the product development department pmd (Product Development and Machine Elements) show that the extent of environmental impacts arising from utilization significantly depends on user behavior, in particular on user-related misconduct. The design of the user-product-interface has a significant influence on user behavior and thus on the environmental impacts and the costs resulting from the use of active products. Therefore, measures for reducing environmental impacts arising from misconduct should be developed.

An efficient way of supporting the product developer during the prospective design of products and the selection of the processes involved according to technical, ecological and economical aspects, is the provision of recommendations on behavior. Therefore, environmentally relevant rules for product development should be derived from the results and evaluations and be made available.

After the completion of the 4 subprojects, all electronic information flows should be automated. The result evaluation will also, as far as possible, be carried out automatically resp. by software. An interpretation according to scientifically developed methods is also intended.

A development of methods within the subprojects for forming a methodology for the rational realization of the described goals with different products or product groups would be desirable.

3. Objectives

The following objectives can be derived from the explanations above:

- Identification and integration of ecological, economical and technical product features in the selection and evaluation of products for the end consumer in the purchasing decision;
- Querying of the evaluation parameters after the purchasing decision by the consumer;
- Informational support of the end consumer during the purchasing decision and the utilization phase und simultaneous analysis of his usage behavior concerning the purchased product;
- Reintegration of the results into the company of the product manufacturer in particular for the product predevelopment, the product development and the product marketing;
- Use of mobile and internet-based systems for optimizing the information flow between product manufacturer and consumer/product user.

Essential for the described subprojects is the existence of suitable conditions. This includes the cooperation of the corresponding university departments, the involvement of the industry and of GPA. The coming into being of the relevant cellular phone technologies, e.g. HTML-based devices, of the corresponding cellular network generation, e.g. UMTS, is beneficial for the described projects but not obligatory. Also, the first trial customers should be equipped with appropriate devices and corresponding motivation.

4. Conclusions

The described projects illustrate a comfortable and quick way of receiving important information on the purchasing decision and the user behavior of consumers. The return flow of information to the product manufacturer, i.e. to product development and product marketing can begin immediately after the launch of the product. This opens up a new informational dimension with time and development advantages in product development. The use of the media cellular phone network resp. mobile radio network and internet enable support of the customers and of the product development and product marketing. After positive verification and validation of the described subprojects the procedures can also be transfered to other products.

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