AN APPROACH FOR DEVELOPING USER INTERFACES FOR PRODUCTS OF THE FUTURE

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Abstract: A good user interface is a necessity for producing successful products in the future. Rapidly changing user expectations and technologies challenge companies to compete with innovative solutions. The future-oriented companies are decidedly ahead of the field. However, making use of methods of advanced research and procedures appears to be difficult for companies. In this study methods of research into future developments are compined with methods of advanced product and user-interface development so that they supplement good industrial product development practices. *Copyright © 2000 IFAC*

Keywords: interfaces, usability, concept design, future, scenario, risk management

1. INTRODUCTION

User expectations are changing and new technologies are advancing faster than ever. In the future, high quality user interfaces will be even more important than today. The main function of a user interface is to enable the user to perform tasks on the product and to reach his/her goal with the product. Usage of the product must be productive, safe, easy to learn and reliable, just to mention a few criteria.

Companies have many possibilities and needs for innovation in their user interfaces. An active company is able to lead the development of new concepts and to defend their existing products when necessary. A passive company only reacts when the change has already been made and the company finds it is lacking essential knowledge and resources. For the passive companies, development of new concepts and products is hopelessly delayed and markets are already saturated with competing products. The active, future-oriented company is decidedly ahead of others. Therefore, methods of research into future developments and methods of advanced product development have to be combined on the basis of

experience gained from good industrial product development practices.

New methods alone are an insufficient help for companies. Product development culture must be built comprehensively on the basis of the product conceptions, attitudes and suppositions of the designers, manufacturers, service providers and marketers. New methods for organising action are required. The development must be done at a higher level than in previous projects, because of the uncertainties involved.

The main objective of this project is to develop an approach to

- help companies to create new user interface concepts, which meet the future challenges
- help companies to modify their existing user interfaces in order to succeed in a changing environment and to extend their lifespan into the future
- help companies to evaluate user interfaces targeted at the future environment.

2. APPROACHES TO THE FUTURE STUDIES

Pasking (1997) suggests that people have three ways of thinking future. A person having the fatalist approach keeps his/her head down and hope that the future is favourable. A person having the rapid response approach try to be as flexible as possible and try to adapt to changes of the future. A person having the purposeful approach defines what is the favourable future and make sure that it happens. The advanced companies have the possibility to make the favourable future happens.

The future can be studied on the basis of three paradigms (Mannermaa 1991)
* the descriptive paradigm
* the scenario paradigm
* the evolutionary paradigm.

The descriptive paradigm assumes that events in the future are predictable. The technology forecasting is a typical example of the descriptive paradigm. The main problem of the paradigm is the ambition to define probabilities of the events of the future, which is difficult or impossible.

The scenario paradigm aims to create alternative scenarios about the future. The results facilitate the present decision making. Typically the scenarios describe both desired and the threatening future circumstances and chains of events. The scenario paradigm is widely applied in the strategic business management of companies.

The evolutionary paradigm consider that human activities are occurred in systems which are dynamic, unlinear and far from the thermodynamical balance. The evolutionary paradigm is applied in studies concerning societies.

Practical methods for the future studies of technology are developed on the basis of the paradigms. Methods and taxonomies are presented by Coyle (1997), Watts and Porter (1997), Slaughter (1996), Koskela and Seppälä (1983) among others (table 1).

3. THE APPROACH FOR DEVELOPING USER INTERFACES FOR PRODUCTS OF THE FUTURE

3.1 Preparation of preconditions and project planning

Development of future user interfaces is strategic in nature. The design team must have a clear understanding of the differences between the development of present and future interfaces. The development team must have sufficient motivation, competence and resources to clarify project objectives and common rules, and to carry out the project planning and execution. In addition, a future-oriented development project lasts longer and cause greater risks than a traditional project. Therefore, the future-oriented development project requires more careful management than the traditional development projects. The preconditions do not necessarily exist and so they must be created. Commitment of management and development teams to future-oriented development is a necessity for successful projects.

3.2 Development of concepts of user interfaces

Future changes create threats to the present product concepts and open up possibilities for totally new product concepts. Present products are modified to fulfil the new requirements of the scenarios., while the totally new concepts fulfil or create new needs and requirements. The development of the user interfaces of the future product is based on the scenarios concerning the use of the product by people in the future. It is the development of product concepts consisting of the essential characteristics and qualities of the products.

To meet the future, the factors acting the future need to be identified. The present factors can be verified by observing their existence or state, but the future is more difficult to verify. In the future, the present factors may change or fade away and new factors may appear. In many cases, it is impossible to make quantitative predictions about the future of the existence or the states of the factors. This uncertainty need to be managed during the design of the user

Table 1 Methods for the future studies.

Analytical methods	Subjective methods
Analysis of patents	Journey of exploration
Analysis of publications	Novellas and prophecies
Analysis of history	Science fiction.
Analysis of errors and blunders	Focus-groups
Analogies	Interviews
Morphology	Questionnaires
Analysis of research activities	Straw polls
Growth and trends of publications	Scenarios
Technological issues and discussions	
Maturity of issues and discussions	
New technologies for applications	
Analysis of cause and consequence	
Interrelation matrix and simulation	
Trend extrapolation and correlation	

interfaces of the future. The uncertainty can be managed by building up alternative scenarios about the future and by comparing the scenarios with actual events (figure 1). The course of events provides information about the future, decrease the uncertainty concerning the future and affirm a specific scenario. The scenario provides an early detection of the most plausible future development.
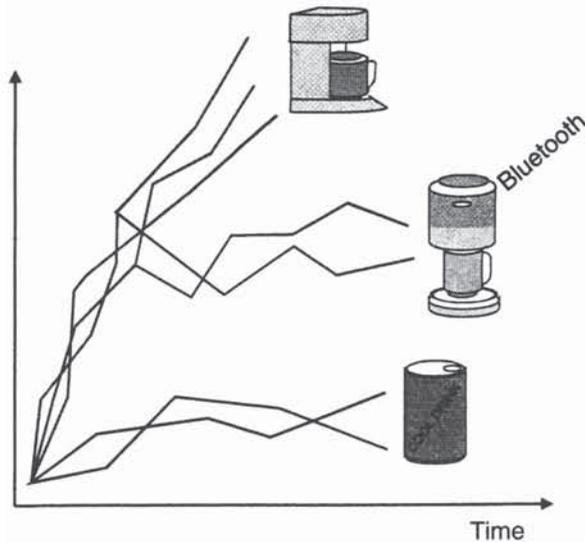

Fig. 1. An alternative scenarios about a coffee maker.

The factors acting on the future can be identified on the different levels of generality (figure 2). The general trends concerning the global development, the environment, politics, societies and peoples provide important backround information about the future. The industrial trends reveal product and production technologies of the future and the content of products.

The trends concerning customers focus on activities, problems and needs of the customers in the future circumstances. The trends also cover social and ethical issues and peoples values, as well as users' abilities, capabilities, desires etc. that enable or restrict the development of product concepts and user interfaces.

The trends concerning the future of the product can be evaluated according to an operational product concept (figure 2). The operational product concept captures the essential features of a product from the viewpoint of how the customers will use it. The users and their needs in the future are evaluated together with the future needs for the product. In addition, the benefits of the product and possible technologies that will fit in the product of the future are considered.
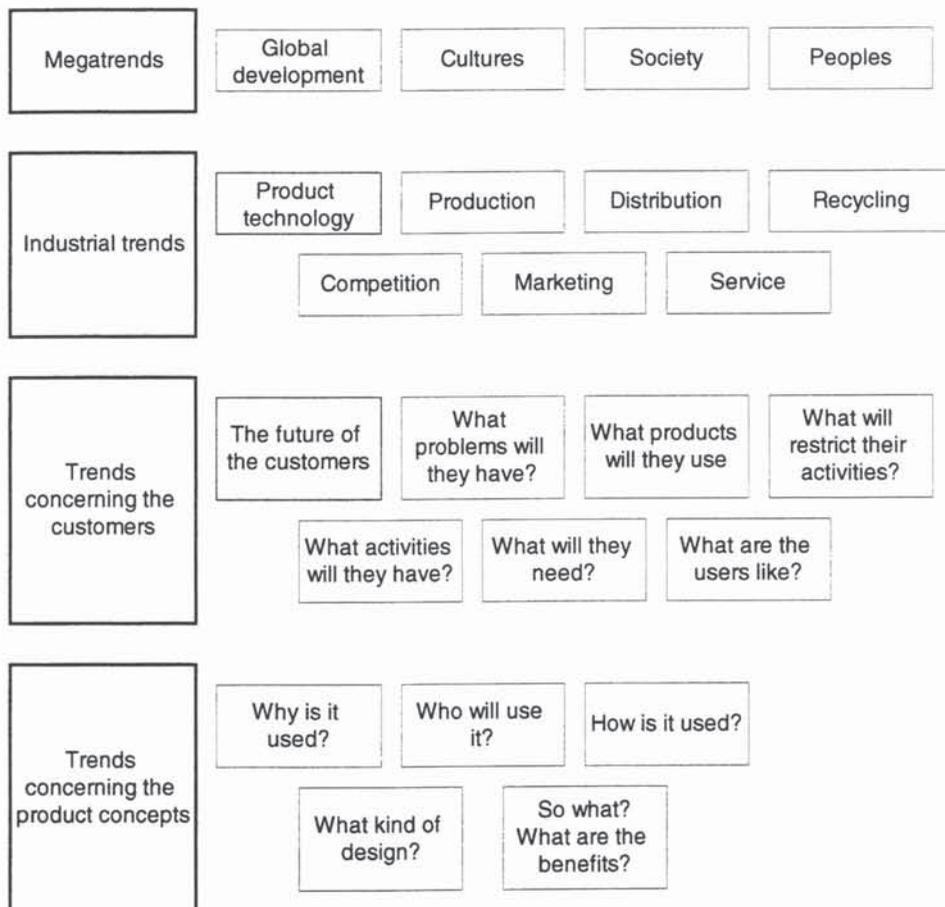

Fig. 2. The different levels of generality of the factors of the future.

3.2 Simulation of concepts in foreseeable future circumstances

The functioning of new concepts is verified in the simulation phase. The aim of the simulation is to model, clarify and visualise the use of the product in foreseeable future circumstances. The users, the products, the environment and the activities must all reflect the future. Mock-ups, role play, cartoon and animation, as well as computer modelling and virtual reality can be used to visualise the future. The events of the future can be modelled, for example, by cause and consequences analysis and by an interrelation matrix.

Modern user interface development uses simulation in analytical studies and usability tests. Simulation of future situations poses the problem of simulating all elements of the new situation, the technical and social environment, the culture, the users' attitudes etc. This calls for advanced techniques like drama.

3.3 Evaluation of concepts and decision-making

New concepts of products and user interfaces must be evaluated using interdisciplinary methods in order to discover future requirements and the risks to be managed. The evaluation is based on the experience obtained from simulation of the interface and the product concept. In addition to usability, management has to consider the business demands and risks related to the uncertainties.

The main challenge in the future oriented design of user interfaces is the company's ability to look ahead at alternative possible scenarios and to follow the right scenario. The risk management, decision-making, follow-up, and actions at a favourable time play an important role in the management of future products. The company has to select the most advantageous concepts for further development and freeze certain concepts to wait an opportune moment. The favourable scenarios must be supported and the most important milestones between present and future user interfaces must be identified and followed. Simultaneously, the company has to maintain necessary resources and capabilities to carry out the product design projects that aims to the market.

4. DISCUSSION

The approach is being applied and tested in visionary Finnish companies having capabilities to work with product concepts. The management of technological advances and foreseeing of user needs, together with management of complex product information and risk management, have been the major challenges. The early experiences have shown that the studies of the future help companies to explore the future of the operational environment and to gain valuable information about the users and to use scenarios of future products. The managers of design and design teams can also use the approach to map out their future needs and possibilities for user interfaces.

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