Future user interfaces are developed today

Jouni Kivistö-Rahnasto, Matti Vuori, Sirra Toivonen, Arto Hippula, Pekka Maijala

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. VTT Automation has taken up the challenge to combine methods of research into future developments with methods of advanced product and user-interface development so that they supplement good industrial product development practices. The result is a toolbox of practical methods applicable in different fields of industrial development.

Introduction

User expectations are changing and new technologies are advancing faster than ever. High quality user interfaces will be even more important in the future than today. 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.

Usage of extensive methods in the latest research and procedures appears difficult when companies are struggling to keep practical designing going, under the pressure of limited resources. 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. Both

new concepts and existing products have to be taken into consideration when integrating different approaches. Management of technological advances, foreseeing of user needs, together with management of complex product information and risk management are the major challenges. An obsession with technology is a serious hazard in future-oriented development.

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.

Developing concepts of future user interfaces

The operational environment of future products and user interfaces is three to ten years away, or even more. The future users, their needs, values and desires, or the technological or social possibilities and restrictions are not known today. Therefore, today's suppositions regarding the product and its use need to be challenged and reconsidered. Future needs differ from present ones and call for a dynamic product development attitude. Product development has to be prepared for continuous changes in the operational environment, user needs and for new opportunities in product designs. We will outline the most important elements of these phases.

Qualities of a successful user interface

The main function of a user interface is to enable the user to perform tasks on the product and to reach his/hers goal with the product. This means that the interface must have all required functions. They must also be implemented so, that the result is usable. Usage of the product must be productive, safe, easy to learn and reliable, just to mention a few criteria. The design should be based on the needs of the users. The designers need to know what kind on people are the users and how they really work with the product, and what are their preferences? These questions are hard enough to answer in case of today's products. When designing tomorrow's products, we have to plan for future users and their needs. Designing of the user interface and designing the whole product and the system where it is used are inseparable.

One aspect, which is sometimes neglected, is the desirability of the user interface. With today's products, the interface is often the face of the product. Sometimes the interface characterises the product more than any other component. On the contrary to what the users might claim during interviews, looks do matter. Visual preferences develop within the culture and cultures change. We must take into consideration what the product communicates with its look and feel. Companies are not always aware of what their brand messages are – and what they should be. Products give messages, for example about durability, friendliness, safety and advancedness with very subtle clues. Many products live or die with these messages.

The needs of all interest groups must be considered and weighted during designing. The sales chain is very important for many products. To be marketable to the sales chain, requires the interface to have the following qualities (among some others):

- Good brand representation
- Newness and innovativeness
- Easiness to demonstrate the value to the customer
- Easiness to train to the users
- Cost efficiency
- Low support needs

And lastly, the company must be able to manage the user interface technology. Companies are always tempted to use the sexiest technologies available. But implementing them solidly in the product range is difficult and takes resources. Choosing new technology requires investment in usability, desirability and safety designing. The risks of new interface types are plenty, but so are benefits, if the designing is done with good risk management. The holistic, task and needs based approach, as developed by VTT Automation, gives tools for this.

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 requires more careful management than 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.

Phases of the development of the concepts of future user interfaces
Preparation of preconditions and project planning
Analysis of history, present and future
Development of future product concepts
Simulation of the concepts in the foreseeable future circumstances
Evaluation of the concepts
Decision-making

Analysis of history, present and future

The analysis of history, the present and the future is aimed at stretching our perspective to include the future. To meet the future we need to understand the reasons for the present situation. The present needs and possibilities may change or fade away and new needs and possibilities may appear. The possibilities are not limited to technological advantages. They also cover economic, social and ethical issues, as well as users' abilities, capabilities, needs, desires etc. that enable or restrict the development of product concepts and user interfaces. The most important results of analysing the future are the scenarios concerning the future environment, users and activities, product requirements and restrictions, together with potential solutions. It is important to extend the scenarios to concrete actions in usage situations: how, hypothetically, will the users act? The scenarios of the users and the use of products lay the foundation for the development of user interfaces for the future.

Development of future product concepts

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 future product- and user interface concepts is based on 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. The development covers the concepts of customers, users and products and their interactions including use scenarios, values, functioning, advantages etc. The practical implementation of new products follows later. Of course, many concepts will never be realised, because we will find that the scenarios for which they are designed will not materialise or will not to be feasible. Choosing from a set of alternatives is the basis of future development.

Simulation of the 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

Analytical and subjective methods for analysing future

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
- Basic research	Scenarios
- Applied research	
- Development	
- Applications	
Social consequences	
Growth and trends of publications	
Technological issues and discussions	
Maturity of issues and discussions	
New technologies on the basis of application	
Analysis of cause and consequence	
Interrelation matrix	
Trend extrapolation	
Correlation	
Simulation	

The concepts are simulated in foreseeable future circumstances.

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.

Evaluation of the concepts

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. The evaluation of the concepts focuses on usability and verification of the scenarios. In addition, management has to consider the business demands and risks related to the uncertainties. Careful evaluation of different aspects of the future and its uncertainties makes it possible to establish alternative routes from the present to the future.

Decision-making

Development of concepts of future products and user interfaces does not lead directly to the manufacturing and distribution of products. The development of future products is a strategic process and further development is always needed. The decision-making, follow-up, and action at a favourable time play an important role in the management of future products. Several aspects must be considered:

- What are the most advantageous concepts for further development?
- What concepts will wait an opportune moment?
- How do we provide support in order to realise favourable scenarios?
- What are the most important milestones between present and future user interfaces?
- What is the timescale for the development projects?
- What are the risks and what risks will we take?

Product management of future concepts is based on alternative scenarios and plans. The main challenge is the company's ability to follow the right route. Also, the company has to look ahead at alternative possible scenarios.

The toolbox

To meet the challenges of facilitating the design of future user interfaces, methods and procedures were developed and tested by VTT Automation together with visionary companies. The development is supported by TEKES. The main objectives of the development were 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.

VTT Automation developed a toolbox of practical methods to support these phases. The toolbox contains tools both for managing development and for the methods-forms, checklists etc. The tools, designed primarily to give Finnish companies the edge, are currently available in Finnish at the WWW address http://www.vtt.fi/aut/

rm/projects/smart/, together with many papers documenting the approach taken in their development.

Conclusions

The development of future user interfaces is full of great possibilities. The managers of design and design teams can use studies of future developments to map out their future needs and possibilities for user interfaces. Studies of the future also help companies to explore the operational environment, to gain information about the users and to use scenarios of future products. At the same time, uncertainty is an inseparable part of the future, causing risks for product development. Advanced risk analysis and risk management are essential for future-oriented product development.

Management of future-oriented design processes is a demanding, serious and difficult task. The special characteristics and demands of the future and the related uncertainty must be taken into account in both management and practical processes. Future-oriented development is a strategic effort, aimed at creating readiness for the rapid development of future products and user interfaces when the time is ripe. The implementation of the alternative concepts goes ahead on the basis of a scenario that is being realised. The limited development resources are not wasted on unessential and fallacious assumptions about the future. The main challenges of future-oriented product development are related to the production of reliable scenarios and roadmaps for the future, and to the evaluation of future product concepts and user interfaces in the predicted circumstances.

Arto Hippula
B. Sc.
Research Scientist
VTT Automation

Pekka Maijala
M. Sc.
Group Manager
VTT Automation

Jouni Kivistö-Rahnasto
Lich. Tech.
Research Scientist
VTT Automation

Matti Vuori
M. Sc.
Research Scientist
VTT Automation

Sirra Toivonen
M. Sc.
Research Scientist
VTT Automation

References

1. McDermott, W. B. 1996. Of the Unexpected and Inintended Futures. Futures, Vol. 25, No 9. pp. 997-1006.

2. Slaughter, R. 1996. Mapping the Future: Creating a Structural Overview of the Next 20 Years. Journal of Futures Studies, Vol. 1, No 1. pp. 5-25.

3. Van Wyk, R. J. 1997. Strategic Technology Scanning. Technological Forecasting and Social Change. Vol. 55. pp. 21-38.

4. Watts, R. W., Porter, A. L. 1997. Innovation Forecasting. Technological Forecasting and Social Change. Vol. 56. pp. 25-47.