User-Centred Creation of Mobile Guides

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ABSTRACT

Increasing numbers of users will want to access mobile guides and related tourism and travel services. Do developers of innovative electronic information services take user needs appropriately into account, so that the new services will achieve success as expected?

An overview on the state-of-the-art of user needs analysis and user validation for mobile guides will be provided based on information from the published literature as well as from members of developments teams in the interactive electronic publishing domain who have shared their knowledge and their experiences in case studies where user needs analysis and user validation were conducted.

Awareness of the need for user involvement and user validation in the product creation process exists after more than 20 years of research in HCI. However, the selection and tailoring of the most effective approach for a given project is often still carried out ad-hoc.

The VNET5 network (funded by the European Commission) is a forum which helps RTD teams and organisations to develop competence and to exchange experiences about user-centred product creation, with a strong focus on content-oriented services and the electronic publishing domain.

Keywords

User-Centred Product Creation, Process Improvement, User Validation, User Needs Analysis, Next-generation Mobile Devices.

1. INTRODUCTION

Increasing numbers of users will want to access mobile guides and related tourism and travel services with various devices and platforms, via different networks, at any time and from any place, for leisure and entertainment, and for business purposes. Do developers of innovative electronic information services take user needs appropriately into account, so that the new services will achieve success as expected?

In this presentation I will provide an overview on the state-of-the-art of user needs analysis and user validation for mobile guides. The information has been collected from the published literature as well as from members of developments teams in the interactive electronic publishing domain who have shared their knowledge and their experiences in case studies where user needs analysis and user validation were conducted.

Awareness of the need for user involvement and user validation in the product creation process exists now – after more than 20 years of research in HCI - widely, and a growing range of techniques and methods for supporting a user-centred product creation does exist. However, there are still considerable deficits in making these opportunities as productive for industry as we consider possible and desirable: The validation of specific methods and tools remains quite incomplete, and the selection and tailoring of the most effective approach for a given project is often still carried out ad-hoc (not surprising, since decision must be made on the basis of incomplete methodological background).

The VNET5 network (funded by the European Commission) is a forum which helps RTD teams and organisations to develop competence and to exchange experiences about user-centred product creation, with a strong focus on content-oriented services and the electronic publishing domain.

Customer and user involvement in product creation extends throughout the product lifecycle, providing links to market research and product strategy, including user interface design and system integration, and to market feedback and audience responses.

2. RATIONALE

2.1 Rationale for user-orientation in the product creation process

The aim of user-oriented development is to develop systems and services which correspond to user needs, are accepted and used, and which deliver added value to the owners and users of the products.

Different from hardware (where production costs are significant), the main share of the cost of software-based systems occurs during the development phase, therefore user centred product creation in software systems is especially cost sensitive. The cost of design modifications increases as the development process advances, the later design deficits are detected and rectified, the higher the cost. Later modification of products not only increase development cost considerably, but also cause opportunity costs due to delayed product introduction. Therefore the motivation to detect and correct errors, to detect user problems, and to improve shortcomings and weaknesses early in the development process is high. Due to the rising cost for the improvement of shortcomings, often in late development phases they tend to be accepted and deteriorate the quality of the product.

To conclude, quality of use and quality of content of interactive products and services are of considerable value for the customer (who buys the system and expects the business benefit), for the user of a system, and of course for the producer and owner of a product.

2.2 Dimensions of quality

Quality for the user is factored into a number of dimensions, some of which are agreed, others are described differently by different experts. Users put different weight on quality

dimensions, depending on the tasks they intend to carry out, and also according to individual preferences and prior experience. The dimensions of the concept of quality of use comprise a number of rational factors describing interaction aspects (such as efficiency of task execution, learning effort, cognitive workload, effort for error correction and others), quality of the information (which is less frequently investigated, and is described for example as authority of the author, reputation of the source, accuracy, objectivity, up-to-date-ness, range), and affective factors (such as attractivness, engagement, frustration, time flow, physical, psychic, mental requirements, effort, trust, privacy).

The weight given to different quality dimensions varies with the application, the user group, and the context of use. The evaluation of the user quality must be based on a thorough understanding of the dimensions which are important for the users.

2.3 Product Lifecycle and the product creation process
The product lifecycle and the implementation of the product creation process for software products as well as for electronic publishing products varies widely for different types of products. It includes information products with very low demand concerning validity as well as products with a lifetime whose end is not foreseen, technical information which is updated regularly, and where high accuracy is assumed, or entertainment and lifestyle information which is updated fast and superseeded quickly.

Large organisations who maintain products with a large budget and customer base, irrespective of the domain or type of information, have usually developed their own quality management processes which is specific to their organisation and product spectrum, and which include user centered activities (as is the case in traditional industries). The development of these processes over a long time has often included painful and costly experiences, and provides most value and security when the products in question have reached a stable state of development. The opposite is the case with new products and with smaller organisations who invest a large share of their resources into new services: Both the probability and the cost of product failure is considerably higher. Especially with new products and services, and smaller organisations, the benefit of planning user validation specifically for their context should be taken into consideration.

Planning user validation must start from an understanding of the project objectives, business goals and success criteria, knowledge about users and customers, and their context of use. The VNET5 resources and guidelines are designed to help to tailor user validation to the needs of the project, and to constraints such as timing, available resources, access to users and competencies in the project team.

The VNET5 common approach to user-centred product creation provides guidance throughout the process.
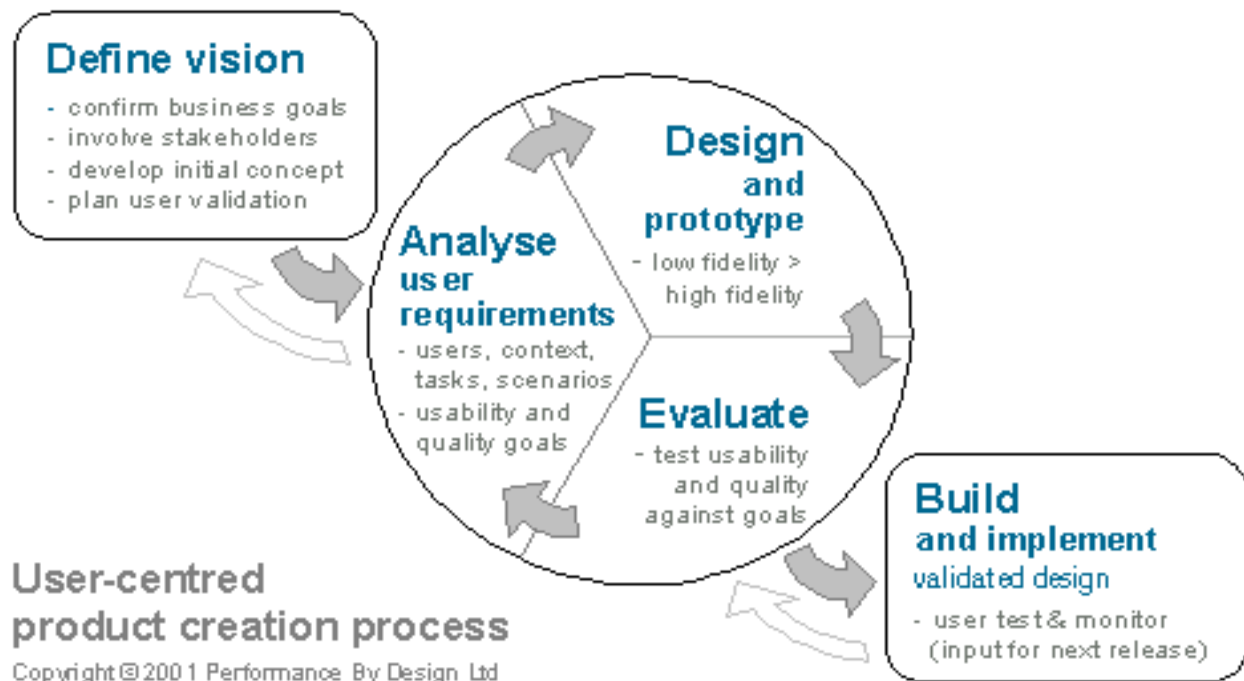
2.4 VNET5 Common Approach to user validation
The development of a user validation plan has been identified as the most crucial step where new projects often need external support from experienced practitioners.

The development of professional competence in user validation is the key element of long term strategy to improve the user quality of products and services. It takes time to develop the required knowledge, skills and experience in-house. The right investment into competence development makes an essential difference to the product creation process. As part of the VNET5 approach the competence development is

given attention together with the introduction of a working process for the ongoing projects.

2.5 VNET Resources contain best practice in user-centred product creation

The VNET5 resources [1] are designed to give an unbiased view of how to approach user-oriented product creation for an individual project, and how to select the most appropriate methods and tools.

The Start-Up Guide is a brief introduction, limited to the essentials, and directs the attention of newcomers to user validation to the parts of the handbook which are most relevant for them, given their objectives and the problems which have lead them to visit the site.

The **VNET5 Handbook** [2] introduces the background of the VNET5 common process. The electronic version of the VNET5 Best Practice Manual is a restructured and updated version of the paper document, including up-to-date references and glossary of terms.

The **Resource Center** contains a database with the descriptions of tools for user validation, including evaluation methods and design guidelines, and also forms and templates for user validation planning, links to other directories and lists. Some resources are included, all are described in a structured manner with their important characteristics and references to access these resources. Methods and tools are described in terms of cost, constraints and results, validation status, and other characteristics. A **Resource Finder** helps to find the resources corresponding to specific quality criteria and project constraints. **Method Maps** summarize how methods and tools relate to each other. Both Resource Finder and Method Maps facilitate the comparison of methods and metrics for user validation. Development teams are able to select the approach which is right for their project and for their level of competence.

A short **VNET5 maturity self-check** [3] allows organisations to review where they stand, and to suggest which kinds of further activity are appropriate:

Suggesting a choice of approaches, methods and tools

Indicate appropriate route for competence development, for example in-house, in cooperation with VNET5 (which can provide some of the needed competences).

3. STATE-OF-THE-ART OF USER VALIDATION OF MOBILE APPLICATIONS

IST projects which joined the VNET5 project as members have participated in coaching, training in workshops and have received web-based support from experts to improve their user validation planning and activities. A number of these IST projects develop mobile applications. The analysis of the state-of-the-art of user validation is based on the cooperation and exchange of experiences with these VNET5 members and most of the information described can be found on the web sites of these projects. The following presentation summarizes the user centred activities typically carried out in these projects in the different project phases.

Contextual inquiry and design was carried out in the projects CONTESSA (Cross Media Publishing) [4], CAMPIELLO (Tourist Information Systems) [5], and iMEDIA (Intelligent Television Advertising) [6]. Contextual design as promoted by Beyer & Holtzblatt [7] was considered a conceptually good approach, but very labour intensive. 1-2 day site visits are not sufficient for user needs elicitation, as has been claimed. Approaches to user needs analysis that worked well, especially in the CONTESSA project, were 1) asking the user partners in a project to provide available user data, 2) benchmarking of existing systems to make decisions about useful features, and 3) building rapid prototypes for new features and testing these with users. Feature lists and UML specifications are not considered sufficient for the specification of system requirements. The involvement of a developer in user requirements collection was found to improve the results of user needs analysis. Other pitfalls detected were discrepancies of user versus customer goals, and user versus consumer needs.

In the project mEXPRES project (mobile in-EXhibition PRovision of Electronic Support Services) [8] contexual inquiry was also applied for capturing end-users requirements. Different types of users (visitors, exhibitors and organisors of exhibitions) were observed in their working environment (exhibition hall), short and long, in-depth interviews were carried out with different users. Contextual Inquiry is suitable for capturing user needs for innovative services when complex data in information rich environments with frequent user interactions have to be collected without loosing detail. A combination of different techniques (observation, questionnaires and interviews) with solid preparation and pilot test is considered useful for a Contextual Inquiry.

In the project GiMoDig (Geospatial info-mobility service by real-time data-integration and generalization, [9], [10]) a desk study of user requirements for mobile services utilizing topographic maps has been carried out. Studying literature helped to collect relevant information about users and their goals, about the context of use, dataset and technical requirements. User tests with existing topographic maps, carried out in the lab and in the field, provided additional user needs and experiences for planning and carrying out future user tests. For a more infrastructure oriented project like GiMoDig the desk study provided sufficient information for the definition of a number of application scenarios and use cases with varying criteria. The existing methodology is appropriate for the analysis of the needs of end-users. However, other methods are needed for the analysis of the needs of service providers (eg. performance and response time of the service).

In the project INMOVE (Intelligent Mobile Video Environment) [11] user scenarios and personas [12] were defined for end-user oriented applications (eg home care, car surveillance, football application) and user acceptance of these concepts was investigated with prospective users in focus group sessions. User feedback helped to modify the scenarios and to reject scenarios which the users did not like. Collecting and updating the user needs and requirements results in four separate tables caused a significant amount of paper work. The engineers point of view in this project that "functional requirements means compulsory, non-functional means optional" was critised. It is essential for the success of consumer products to seriously take into account non-functional user requirements.

User requirements analysis with online questionnaires was carried out in the project LoVEUS (Location Aware Visually Enhanced Ubiquitous Services) [13]. 286 of 325 completed questionnaires were analysed. A difficulty encountered was

that mainly "technology adopters" completed the online questionnaire. These were users with a specific profile: more male than female, young persons with a high level of education, skilled in using PC, PDA or mobile phone. In addition 60 customers were interviewed by telephone call. The difficulty with telephone interviews was that an extremely high percentage of customers refused to participate in the interview after the first questions that corresponded to application scenarios. Similar difficulties were encountered in projects PiSTE (Personalised, Emmersive Sports TV Experience) [14] and MELISA (Multiplatform ePublishing for Leisure and Interactive Sports Advertising) [15].

End users' attitudes towards mobile music services in Europe were investigated in the MUSICAL project (Multimedia Streaming of Interactive Content across mobiLe networks) [16]. Key success factors for MUSICAL could be detected with online questionnaires and in-depth interviews. The techniques were useful for example to learn about the willingness of music consumers and music professional to pay for MUSICAL, about important selection criteria, relevant functions requested by users, and national differences of music consumers.

In the project SCALEX (Scalable Exhibition Server) [17] professional user´s needs were collected from the user partners in the project with questionnaires and interviews.

The field trials in the project CRUMPET (Creation of user-friendly mobile services personalised for tourism) [18], [19] were carried out to assess the general benefits of the CRUMPET service and its usability by users and to validate user requirements. In addition, users have been observed as part of a formative evaluation of the usability of the service. The standardized SUMI questionnaire [20] was applied to measure user satisfaction. A tailor-made questionnaire was used to measure added value and to find out details about specific likes and dislikes of users.

4. CONCLUSIONS

A broad range of techniques for user needs analysis is currently applied in representative RTD projects which develop mobile services: Desktop studies and literature surveys, scenarios and personas, focus group analysis, use cases, also comprehensive contextual inquiry and design including a combination of several techniques like observation, interviews and questionnaires.

Efficient and effective techniques are preferred. On-line questionnaires are often seem as an appropriate solution in this respect, even though the responses come to a large extent from so-called "early adopters" or "technology adopters".

Some projects build on results from preceding projects by using, improving and extending previously used tailor-made questionnaires, by investigating the literature and by searching for available data from user partners and from other departments in the companies and organisations involved in a project.

Techniques which can be applied very early in the development process seem to be preferred in most projects.

User testing in the field with devices similar to those under development, but already on the market, or with competing products are essential for a full and complete assessment of products and services. Often these are carried out in the form of "field experiments", and sometimes with prototypes or in

simulators. This is a secure manner to assure that realistic environments and a valid context of use is studied. This is an excellent approach, but requires considerably more time and other resources.

Several specific shortcomings were observed quite frequently. In many cases the sample size of user tests was not very large (below 10), which generally is too small to come to valid and reliable results. Often tailor-made questionnaires to investigate user acceptance and user satisfaction were preferred to standardized questionnaires. It should be remembered that the results of questionnaires which are not validated for the purpose can not be generalised, and may be difficult to interpret. Questionnaires in scientific research are not just a list of questions, but measurement instruments which are developed and validated according to scientific standards – this fact does not always seem to be understood. Ad-hoc questionnaires may be acceptable if nothing else is available, but validated questionnaires deliver considerably more valuable information. Validated questionnaires (eg SUMI [20]) are preferable and available for a number of applications.

It was also observed that sometimes methods for user tests are selected which are too complex (such as contextual inquiry and design) for the limited effort and resources available, and do not deliver much benefit for the amount of effort invested.

The main deficit however was the incomplete integration of user validation activities into the project plan and into the specific product creation process applied by the organisations which participate in the project. This supported our assumption that the planning capability for user testing is the main process by which the quality of user oriented activities in projects can be improved. The participants in the VNET5 workshops and coaching trajectories for individual projects confirmed this by their consistently positive response, and by the fact that a clear and consistent improvement in the quality of user validation activities was observed in the VNET5 project.

5. ACKNOWLEDGMENTS

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