User eXperience Tools (UX-Tools)

Nokia Research Center & Aalto University

Overview

User experience (UX) has replaced usability as a framework for user centred design of interactive products especially in consumer products and the service sector. However, UX is conceptually vague and difficult to apply as a New Product Design (NPD) evaluation and management approach. The UX-Tools project aims at creating a set of tools and methods to assist companies in integrating UX into their product development processes. The tools and methods include a UX-Profiler for identifying and defining UX targets, UX-Madness for diagnostic evaluation and development and UX-Index for quantitative evaluation.

The UX-Tools project is related to the research area "User needs and behaviours in the mobile domain" by supporting user and stakeholder centred design of mobile internet services, mobile generated content and mobile interaction solutions.

Background

Since late 90s user centred design (UCD) community has been convinced about the inadequacy of usability as the single framework for modelling human-technology relationships. Even though some well-known definitions of usability emphasize the importance of setting usability into the context of acceptability[1] and overall quality of use in specified contexts[2], the models and precedents of usability have influenced on the usability engineering practices to be focused on and limited to task and work oriented human-computer interaction optimizations. Human beings have been reduced to workers and cognitive performers[3]. This limited conception cannot address the key acceptance and satisfaction issues that are important from the point of view of users' quality of life as well as companies' strive for improved competitiveness and interaction based differentiation.
One of the main reasons to replace usability with broader frameworks has been the changes in the objects of design. Stand alone products and SW systems have been replaced by product-service systems, ubiquitous environments, and co-design platforms[4]. Also, the quality of interaction is now regarded as a key attribute of business success and thus has become not only a product design, but also a strategic design variable for companies such as Nokia[5].

Usability has become obsolete as the single framework of human – mobile technology interaction. Usability engineering and competences in usability are not any more cutting edge knowledge. They do not give competitive advantage for mobile device manufacturers or service providers.

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1 Jakob Nielsen, *Usability Engineering*, New edition. (Morgan Kaufmann, 1994).

2 N. Bevan and M. Macleod, "Usability measurement in context," *Behaviour and Information technology* 13, no. 1 (1994): 132–145; "ISO 9241-11:1998 - Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 11: Guidance on usability."

3 Gilbert Cockton, "Revisiting usability's three key principles," in *CHI '08 extended abstracts on Human factors in computing systems* (Florence, Italy: ACM, 2008), 2473-2484; Turkka Keinonen, "Design Contribution Square," *Advanced Engineering Informatics* 23, no. 2 (2009): 142-148.

4 Eija Kaasinen and Leena Norros, eds., *Älykkäiden ympäristöjen suunnittelu - Kohti ekologista systeemiajattelua* (Teknologiateollisuus ry, 2007); T. Keinonen, "Immediate and Remote Design of Complex Environments 1," *Design Issues* 25, no. 2 (2009): 62–74.

5 Anna Valtonen, *Redefining Industrial Design. Changes in the Design Practice in Finland*, Publication series of University of Art and Design Helsinki A 74 (Helsinki: University of Art and Design, 2007).

The usability paradigm has been challenged and supplemented by contextual user studies, more social approaches paying attention to collaboration, from the point of view of users' subjective motivations and pleasures, and by co-design approaches trusting on users' initiative. Perhaps excluding the safety and security critical industry systems, a broader conception of *user experience* (UX) has been replacing usability engineering as the main human-digital technology framework – sometimes called also affective design or emotional design[6]. When the social aspects of interaction are of special interest and relevance *co-experience* is used instead of user experience[7].

Even though UX has attracted a lot of attention among the interaction design research community, and there are plenty of definitions, mappings, and approaches to design for UX, the concept lacks a universally accepted conceptual frame[8]. Probably one of the reasons for this is the protest movement kind of inclination in UX that has been against the over systematic, analytical and measurement based tradition of usability engineering[9]. Another reason for the lack of rigour in UX is related to the fundamentally subjective and emotional nature of the concept. UX has not been seen as a quality of a product or even interaction with a product, that can be controlled and measured, but a subjective metal construct. This makes replicable and generalizable models and methods difficult to accept and develop for the UX community.

While the fuzziness, subjectivity and the trust on case specific interpretation are logical consequences of the drivers of UX thinking, the lack of rigour leads to problems in operational use of UX as a design and NPD management concept. It is difficult, if not impossible, for product development teams to set UX goals, apply UX as unambiguous segmentation criterion or to evaluate the level and type of UX during the course of product development. The fast pace of product development, the need of customer and stakeholder responses early in the development cycle, the importance of reliable information – especially during the starting economic slow down – and the global business and product development all increase the requirements for UX robustness. There are some commercial interaction analysis tools called user experience monitoring or management tools, but they are not much more than use logging and usability evaluation systems without any experiential character. Consequently, we can say that UX has become a mainstream business management concept, but the present 'hermeneutic UX' conception has set promises that it cannot keep.

Project goal

The goal of the project is the creation of a framework and a set of methods and tools for user experience management in different phases of the product development process. UX has to be interpreted and compromised in the context of a Business and R&D management approach to ensure flexibility and relevance in decision making.

Therefore UX needs to be conceptualized by defining its relationships with usability, technology acceptance, attitude, satisfaction, preference and value. UX has to be integrated in order to support

6 Patrick W. Jordan, *Designing Pleasurable Products: An Introduction to the New Human Factors* (London: Taylor & Francis, 2000); H. M Khalid, "Embracing diversity in user needs for affective design," *Applied Ergonomics* 37, no. 4 (2006): 409–418; Iipo Koskinen, Tuuli Mattelmaki, and Katja Battarbee, *Empathic Design: User Experience in Product Design* (IT Press,Finland, 2003); Donald A. Norman, *Emotional Design: Why We Love (or Hate) Everyday Things* (Basic Books, 2005).

7 E. Kurvinen, "Prototyping social action," *Academic Dissertation, University of Art and Design Helsinki* (2007); K. Battarbee, *Co-experience: Understanding user experiences in social interaction* (University of Art and Design in Helsinki, 2004).

8 Effie Law et al., "Towards a shared definition of user experience," in *CHI '08 extended abstracts on Human factors in computing systems* (Florence, Italy: ACM, 2008), 2395-2398.

9 Kirsten Boehner et al., "How HCI interprets the probes," in *Proceedings of the SIGCHI conference on Human factors in computing systems* (San Jose, California, USA: ACM, 2007), 1077-1086; William W. Gaver et al., "Cultural probes and the value of uncertainty," *interactions* 11, no. 5 (2004): 53-56.

Design requirement management throughout NPD: from goal definition to post launch customer studies.

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Responsible heads of the project: Virpi Roto and Turkka Keinonen

Tasks

The project is divided into the following five main objectives, and correspondingly tasks:

1. UX Framework
Task lead: T.K. and L.G.

The main deliverable of UX Framework is to consolidate and cluster the dimensions of UX based on existing literature, providing a framework for the successive work packages. The sub-tasks for the UX Framework include:

Sub-task 1. Identification of UX-dimensions based on parallel theories and frameworks in interaction design, information system management and consumer behaviour literature.

- results: Analysis of theories and frameworks from existing literature
- activities:

1.1. Review and analysis of existing literature/theory looking at:

a) what they aim at measuring
b) which is the theoretical landscape to which they belong
c) what are the (simplifying) assumptions the models are based on
d) how are these dimensions operationalized
e) what is the scope of application for the models
f) what are the theoretical limitations
g) how are they related to each others

1.2. Synthesis of existing literature/theory into a set of dimensions.

Sub-task 2. Integration of limitations of UX-dimensions in a business and R&D context from UX-Integration Sub-task 1.

- results: Definition of scope of UX-dimensions
- activities:

2.1. Analysis of UX-Integration sub-task 1 results in Workshop XX

2.2. Definition of constraints with NRC in Workshop XX
2.3. Adaptation and analysis of results for defining the scope of UX-dimensions

Sub-task 3. Consolidation and clustering of collected UX-dimensions in several internal workshops
- results: Affinity diagrams and mind maps of UX-dimensions
- activities:
  3.1. Preparation of workshops
  3.2. Conducting and facilitating workshops
  3.3. Analyzing workshop results

Sub-task 4. Development of a preliminary UX-Framework. Decision about criteria for good framework by integrating findings from UX-Integration and earlier sub-tasks.
- results: Preliminary UX-Framework.
- activities:
  4.1 Analysis and synthesis of the results from the preliminary sub-tasks
  4.2 Development of preliminary UX Framework
  4.3 Modification and refinement of UX Framework by workshop XX (with NRC?)
  end of march

Sub-task 5. Refinement of UX Framework
- deliverable: Specification of final UX-dimensions and translation into UX Framework
- activities:
  5.1. Integration of findings from Tasks 2-5
    a) theoretical validity
    b) practical robustness
    c) flexibility over projects and project phases

  5.2. Refinement of UX-Framework in several workshops
  5.3. Final report

2. UX Integration
Task lead: M.N and M.R.

The main deliverable for UX Integration is a process model that integrates UXM, UXX, and UXP into existing NRC processes. UX Integration works in conjunction with a starting NRC project and integrates new methods to it. UX Integration also places measurements to the NRC project basing on UXP, UXM and UXX.

Sub-task 1. Analysis of existing Nokia development processes and understanding the product development domain in which UX tools processes can be utilized
- results: Findings from the analysis
- activities
  1.1. Creating interviews targeting NRC usability, marketing and technical experts
  1.2. Execution of the interviews
  1.3. Analysis

Sub-task 2. Choosing a suitable NPD/service/feature project for integration.
- results: Preliminary UX goals for the project
- activities:

  2.1. Workshop 1 with NRC R&D, marketing, usability and technical experts

a) Choosing a project
b) Understanding used methods and process models in each stage of the project
c) Understanding the limitations and border conditions within the project
d) Setting up preliminary UX goals for the project with the help of UXP

Begins after the workshop on February 9th. Decision to be made before summer.

Subtask 3. Setting up the integration
- deliverable: Enhanced project plan
- activities:
  3.1. Identifying suitable points of contact in Nokia project(s)
  3.2. Modifying the processes found through tasks 2 to 4 to comply with existing processes
  3.3. Outlining a UX Tools enhanced project plan

In August 2010

Subtask 4. Integration of new processes I, in the earliest possible stage of the NRC project
- deliverable: Final UX goals and a matching user segment
- activities:
  4.1. Using UXP to define final UX goals for the project
  4.2. Using UXP to define a user segment corresponding to final UX goals
  4.3. Workshop 2
    a) Refining and agreeing on UX goals and targeted user segment
    b) Setting up measurement items

  September – November 2010.

****Subtasks from 5 onwards relate to the second year of the project.****

Subtask 5. Integration of the new processes II, UXM, before concept level
- deliverable: UXM findings
- activities:
  5.1. Applying UXM in user study and as a partial basis for concept generation
  5.2. Analysis

Subtask 6. Integration of the new processes III, UXX
- deliverable: Findings from the analysis with proposals for improvement
- activities:
  6.1. Evaluating on concept level using UXX
  6.2. Analysis
  6.3. Proposals for improvement

Subtask 7. Integration of the new processes IV, UXX
- results: Findings from the analysis with proposals for improvement
- activities:
  7.1. Evaluating on lo-fi and/or hi-fi prototype level using UXX
  7.2. Analysis
  7.3. Proposals for improvement

Subtask 8. Integration of the new processes V, UXX
- results: Findings from the analysis
- activities
  8.1. Evaluating the final outcome using UXX

8.2. Analysis

Subtask 9. Project wrap-up and final documentation

- deliverable: End report
- activities:
  9.1. Comparing the realized UX goals with planned UX goals
  9.2. Analysing measurement items
  9.3. Analysis of experiences gained from each task
  9.4. Documentation

3. UX Profiler

Task lead: M.N & M.R.

UX profiler (UXP) is a process for specifying the UX design goals for a project or service. The process aims at identifying the UX drivers and if necessary the need for UX based user segmentation. UXP can be used to explicate an organization's own perception about its UX targets, or to profile an external target segment. Tentatively, UXP will be built on mood board type of value and feeling visualizations, and on conjoint type of multi-attribute attitude measurements.

Sub-task 1. A warm-up exercise for both parties: Finding out the most prominent UX factors from an existing product and finding which segment it fits the best.

- results: Comparison and analysis of UX goals (~ 3.5.)
- activities:
  1.1. Selection of a product for which reached UX goals can be identified (iPhone?)
  1.2. Workshop 1 with NRC
    a) Identification of reached UX goals for a product
    b) User segmentation basing on reached UX goals

  1.3. Comparison between realized and organization's projected segments
  to be ready in May

Subtask 2. Development of a process and methods for defining UX Goals for a development project **Reflection on an ongoing project

- deliverable: Refined process model with methods, decision points and steps (beginning of June)
- activities
  2.1. Identifying possible/measurable UX goals, based on UX Framework
  2.2. Identifying methods and process steps, based on UX Framework
  2.3. Producing a tentative process model

**Interacting with an ongoing project: producing a model for defining UX goals, feedback from developers/designers

  2.4. Workshop 2 with NRC
    a) Identifying organization's UX goals for a project
    b) Qualification and selection of UX goals
    c) Presenting the tentative process model
    d) Selection of a user segment for UX goal definition
  2.5. Refining the model based on feedback

Subtasks 3 and 4 to be completed during June 2010

Subtask 3. User segmentation by UX goals

- results: Definition for UX Integration subtask 3
- activities:
  3.1. Choosing suitable UX goals
  3.2. Finding user segments, basing on UX framework and consumer studies
  3.3. Dependent on the findings of sub-task 2

Subtask 4. Creating UX goals based on user segments

- results: Pilot test findings
- activities
  4.1. Identifying a user segment of interest with NRC
  4.2. Creating and selecting methods for user studies
  4.3. Creating and executing pilot tests for selected methods

4. UX Madness

Task lead: T.K. and L.G.

The main deliverable of UX Madness is a specified process for concept creation and diagnostic evaluation of UX in different stages of a product development process.

Sub-task 1. Identification of methods and techniques for stimulating and probing users.

- results: Analysis and list of methods applied in diagnostic product evaluation and related fields.
- activities:
  1.1. Review and analysis of existing literature/theory
  1.2. Synthesis of existing literature into a set of methods and techniques
  1.3. Analysis of applied methods in Nokia based on findings from UX-Integration sub-tasks 1 and 2

Sub-task 2. Development of preliminary UX-Madness methods

- results: Preliminary UX-Madness method descriptions
- activities:
  2.1. Goal setting for the methods
  2.2. Analysing existing methods from related areas
  2.3. Modification and refinement of methods to suit UX context

Sub-task 3. Specification of preliminary UX Madness process model based on findings also from UX-Profiler.

- results: Preliminary UX Madness process model description
- activities:
  3.1. Analysis and synthesis of preliminary process model steps and decision criteria.
  3.2. Creation of preliminary UX Madness process model in Workshop XX.
  3.3. Description of preliminary UX Madness.

Sub-task 4. Pilot study and analysis of preliminary UX Madness process model on interactive prototypes.

- results: Identification of strengths and weaknesses for further refinement
- activities:
  4.1. Preparation of pilot study.

4.2. Conducting and facilitating pilot study on interactive prototypes (IP10) at TaiK.
4.3. Analysis of results, modification and refinement of UX Madness in Workshop XX.
to be ready end of September

Sub-task 5. Testing refined UX Madness process model with one or few product development projects.

- results: Evaluation of data and experiences concerning the applicability of UX Madness process model.
- activities:
  5.1. Identification and formatting of product and development stage specific process steps.
  5.2. Planning of the evaluation sessions with Nokia.
  5.3. Conducting evaluation for the particular project by NRC.
  5.4. Evaluation and experiences obtained from testing UX Madness.

Sub-task 6. Drawing conclusions from earlier experiences with UX-Madness and defining final UX-Madness methods.

- deliverable: Detailed UX-Madness process model description
- activities:
  6.1. Analysis of previous experiences with UX-Madness.
  6.2. Documentation

5. UX indeX (UXX)
Task lead: J.A and N.N.

The main deliverable of the UXX is a process model that specifies how a firm may develop a quantitative survey instrument to measure user experience with a prototype or final product/system. With respect to the survey instrument, the model specifies both fixed measurement items (that are used irrespective of the project/product under development) and product/project-specific measurement items, the formation of which is guided by the process model.
Sub-tasks for UXX include:

Sub-task 1. Identification of fixed measurement items (based on user experience literature and theory)

- deliverable: list of fixed measurement items of the survey instrument to be
- activities
  1.1. Review and analysis of existing literature/theory
  1.2. Synthesis of existing literature/theory into a set of measurement items
  1.3. Modification, qualification, and selection of the measurement items by workshop XX
  incorporating findings from UX Framework.

Sub-task 2. Outlining of the types of product/project-specific measurement items (based on user experience literature and theory as well as workshops with usability experts)

- deliverable: list of the types of product/project-specific measurement items
- activities
  2.1. Review and analysis of existing literature/theory
  2.2. Identification of relevant types of product/project-specific measurement items
  2.3. Modification, qualification, and selection of most important types of product/project-specific measurement items by workshop XX
  Synthesis with findings from UX Integration / UX Profiler

Sub-task 3. Specification of the process model 1: how the specific product/project-specific measurement items should be identified and formatted

- deliverable: preliminary process model concerning the identification and formatting of the product/project-specific measurement items
- activities:
  3.1. Analysis&synthesis of preliminary process model steps and decision criteria
  3.2. Refinement of the preliminary process model stems and decision criteria by workshop XX
  Synthesis with findings from UX Integration / UX Profiler

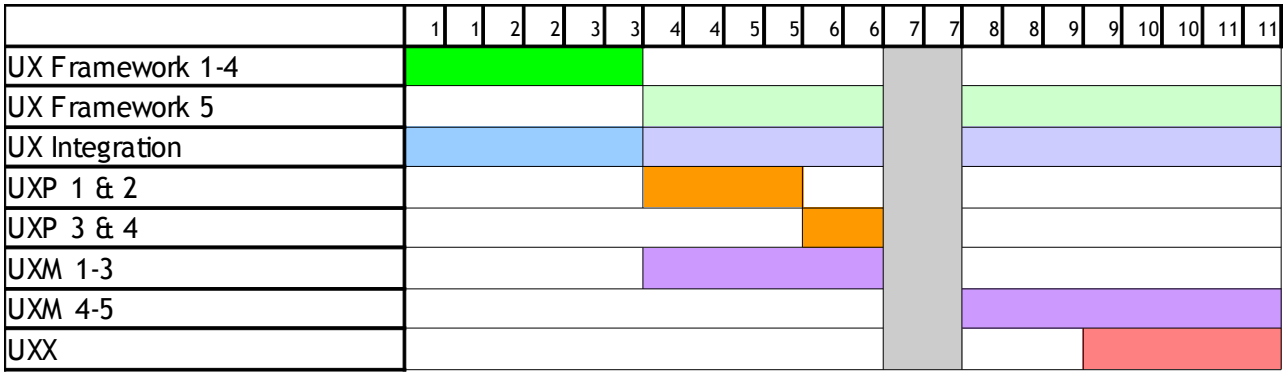
Sub-task 4: Specification of the process model 2: how the survey should be conducted in a particular project (phases of sample selection and data gathering)

- deliverable: preliminary process model concerning the conduct of the survey
- activities
  4.1. Analysis&synthesis of preliminary process model steps and decision criteria
  4.2. Refinement of the preliminary process model stems and decision criteria by workshop XX

Sub-task 5: Testing of the process model with one or few product development projects

- deliverable: evaluation data and experiences concerning the utilization of the process model
- activities:
  5.1. Identification and formatting of the product/project-specific measurement items for a particular Nokia project (based on the process model) with Nokia researchers.
  5.2. Planning of the survey for the particular Nokia project (based on the process model) with Nokia researchers.
  5.3. Conducting the survey for the particular Nokia project by Nokia researchers.
  5.4. Evaluating the data and experiences obtained from testing the survey ,by workshop XX

Preliminary Project Plan Schedule, Year 1



Results and Deliverables:

The results represent intermediate findings and mainly come in the form of internal presentations or reports whereas the deliverables of the project are divided into academic and industrial outcomes.

Academic:

Public dissemination of results as conference papers on international design research, HCI and UX forums. Inclusion of results in doctoral theses...

Industrial:

Process descriptions and demos of the individual tasks. Organization of workshops for sharing the results with all stakeholders.

Milestones:

M1	15.01.10	Focused project plan
M2	23.03.10	Background study and conceptual framework of UX
M3	18.06.10	Concepts of UX design and evaluation approaches
M4	~Sep. 2010	Early prototypes.
M5	~Nov 2010	Early pilot tests and feasibility study.
M6	~Feb 2011	Phase 2 prototypes with study results.
M7	~Jun 2011	Phase 3 prototypes with study results.
M8	~Sep 2011	Phase 4 prototypes with study results.
M9	~Nov 2011	Final deliverables from all tasks.

Workshops:

Workshops are tentatively monthly organized for sharing and discussing the results of the research. To this point the workshops for the first half year of the project are:

W1	15.01.10	Focused Project Plan (M 1)
W2	09.02.10	Business context and R&D context
W3	23.03.10	Background study and conceptual Framework (M 2)
W4	14.04.10	Work package UX-Index
W5	13.05.10	Work package UX-Profiler
W6	18.06.10	Work package UX-Madness, Concepts of UX design and evaluation approaches (M 3)