Innovative leap – designing future ship bridge concepts with Rolls-Royce

Shaping the future
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This presentation gives insight on concept design:

- How to introduce new technology into certain work or activity domain – so that the design solutions are *both* user centered and produce wow-effect?

- How draw “radical” design ideas from ethnographic user studies?

- Ideas based on highly successful group effort:
Case example: UX orientated ship bridge designs of the future – the task

- Rolls-Royce, VTT and Aalto in collaboration
- Design task:
  - Ship command bridge concepts for three vessel types, these being 1) tug boat, 2) PSV and 3) cargo ship.
  - Would have to induce "wow-feeling," reflect "radical design" and be "user-centred".
  - Field and future studies.
The big challenge

Could there be a design approach that is radically future orientated, yet user-centered and applicable in industrial work contexts?

The approach would have to solve a controversy:

- Design solution relates to the (relatively fixed) aims of the professional users (operation, transportation, production, maintenance); but
- Design solution does not conform with the existing user paradigm (things are done differently)

This implies that the designer has to find appropriate means to relate to and distance oneself from data on users – not just what users want but a “step beyond”

- In line with the general controversy in creativity: surprising mental (in practice social) connections needed (creativity) but these connections have to make sense (are not random)
Proposed solution: 5 design principles for "elevating the level of abstraction" and steering the designers’ focus away from the existing ways of doing things – in a reasonable manner

1. Identify and dissect the "main elements" in the work activity, which the design solution is to serve – analyze what is done and why.

2. In addition to the "instrumental" elements in work, envision user experience – in principle, this helps in “forgetting” the existing product, i.e. inspires thinking outside the box.

3. "Reformulate" the findings into "design friendlier" indications: 1) "instrumental" design goals, 2) UX design goals, 3) design themes, 4) scenarios/stories, 5) visualizations of results.

4. Consider how these elements in work activity could be achieved in view of recent and near future technologies?

5. Forget (within reason) the requirements – legislation can be changed and technology will develop.
Proposed solution

Ethnographic studies → design aims, themes, scenarios…

Identification of:
• Relevant instrumental elements in work (what has to be achieved and why; existing work practices)
• Emotional (non-instrumental) values (ux-goals)

Future studies → technological alternatives

➢ So how does this take place actually?
Generating UX-goals – intuitively literature and data driven

- Several UX-goals, e.g. **situation awareness** (extensive literature), **feeling of community** (easily visible in the maritime context), **feeling of comfort** (commonsensical)

- Main design theme **“being one with the ship and the sea”**
  1. Joint-cognitive systems (Woods & Hollnagel, 2006); human–technology–environment-system as a level of analysis and ”level for design”
  2. Reasonable in view of years of studies in complex systems (by Norros)
  3. Also reasonable considering the actual maritime context – anything can happen in the open sea; “togetherness” and unity are important for the mariners at embodied, cognitive, and social levels

- Use reason, empathy and common sense – try to genuinely understand the workers.

- In practice – UX-goals/thinking not separate from “instrumental” goals and understanding of actual work practices.
Identifying the relevant elements in work activity – core-task analysis (Norros)

- Assumes relevant elements in work activity: control demands and resources (what are the practical challenges and how are these met).

- Provides means for differentiating relevant elements in field study findings: how control demands and resources meet in a particular work setting (“core-task demands”).

- Provides a visual model on how these demands and resources are inter-related.

- These inter-relations can be translated into design goals.
Core-task analysis model
Core-task analysis – examples from the future ship bridges case

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<th>Control Demands</th>
<th>Resources</th>
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"being one with the ship and the sea"

Core-task analysis:

7. Dialogue-based communication
   a. Experience of unity and good interaction with others increases work motivation
   b. Radio communication allows knowing the location and activities of fellow crewmembers

Design aim: better communication

Design solution: Tele-present Crew
"being one with the ship and the sea"

Core-task analysis:

8. Flexibility in action and reorientation
   a. Escorting ships with a tugboat requires anticipation of the movements of the escorted boat
   b. This anticipation requires skill and radio communication between the tug and the escorted boat

Design aim: enhanced anticipation on the escorted boat

Design solution: Intelligent Towing
”being one with the ship and the sea”

Core-task analysis:

9. Interpretative nature of activity
   a. Training and work experience allow operation-readiness
   b. Ice conditions are difficult to interpret, especially in the dark

Design aim: better interpretation of the environment

Design solution: Sea-Ice Analyser

Picture copyright: Rolls-Royce
Innovative leaps? Design ideas detached from and attached to actual work activity…

- ”Mediated” process of user centred design:
  - User data -> “abstract” models -> concretization (themes/goals/scenarios/[personas]) -> design ideas
  - Modelling (core-task demands), themes and goals allow to identify ”design problems” with an elevated level of abstraction (not usability specific but from a more general perspective)
- ”Translating” elements of work activity into design ideas by considering how certain ”broad” instrumental aims could be achieved with new technologies
- Not focusing on the existing product but on the potential user experience
“Innovation gears”

Studies on emotional, social, cognitive, societal, “practical”, etc. aspects of certain human activity.

Appropriate and creative combinations.

Review of recent and near-future technologies.

Interaction technologies especially.
Our approach versus common approaches

- Theory driven analysis of user activity -> reformulation into design indications -> design ideas
  Not: exploring users’ wants and needs -> use this as design input -> design ideas

- Overview to new technologies -> contrast against user data -> design ideas
  Not: overview to new technologies -> what just seems cool -> design ideas (e.g., gesture recognition based operation in the maritime context)

- Co-design after the initial design suggestions -> to make the ideas better and to select the best ones
  Not: co-design in the very beginning (direct use of users’ ideas)

- Designing with the attitude that legal requirements can be changed and the technology will develop – leading and modifying the market
  Not: requirement based design
In terms of design literature…

Our approach resembles “contextual design” (Beyer & Holtzblatt, 1998), but we have specific method for analysing work contexts (core-task analysis) (Norros, 2004) and includes future insight. Our approach uses co-design Sanders and Stappers (2008), but predominantly only in the end of the concept design process. Our approach draws from experience design (Hassenzahl, 2010), but also strongly emphasizes instrumental qualities related to work.

In line with joint cognitive systems approach (Woods & Hollnagel) – human–technology–environment system is the crucial level of analysis in generating design solutions and in studying the work contexts.
Success story

Tomorrow’s Cargo Ships Will Use Augmented Reality to Sail the Seas

BY DAMON LAVRINC  03.27.14 | 6:30 AM | PERMALINK

The tug boat bridge of the future will be fully customizable and feature augmented reality. Photo: VTT
Take away messages on concept design

- Identify the main challenges, aims and work practices and consider how new technologies might serve in addressing and enhancing these.
- Do make inspirational stories, themes, scenarios and ux goals – but be both logical and empathetic with these.
- Never mind the requirements (within reason).
- Consider the whole system.

- Hire a great arts designer – good pictures sell better!
- Hire VTT – to ensure that the ideas are good!
VTT’s new innovation service!

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Thank You!

More info: