Integrating HCD into Automation Design
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Acronyms

- **CI** contextual inquiry (a HCD method)
- **HCD** human-centered design
- **UE** usability engineering
- **UM** usability maturity
- **UMA** usability maturity assessment
- **UMM** usability maturity model
Human-Centered Design for Interactive Systems

**Principles:**
- The design is based upon an explicit understanding of users, tasks and environments
- Users are involved throughout design and development
- The design is driven and refined by user-centered evaluation
- The process is iterative
- The design addresses the whole user experience
- The design team includes multidisciplinary skills and perspectives

ISO 9241-210 Human-centered design for interactive systems
Terms & Definitions

- **Integration**: merging HCD with product development, unifying the two processes

- **Institutionalization**: normalizing the new process, stabilizing the new way into standard everyday work; new becomes normal and usual
Why into Development Process?

• Process is a framework for action, it
  • Unifies and standardizes in-house methods
    • The operations are required and controlled
  • Eases project planning and allocating resources
  • Gives measurability
    • Makes it possible to improve the performance

• A development process should be concurrent with the practicalities performed in the development organization
  • If the practicalities are changed, the process description should change too
The Benefits of Institutionalized HCD

• Faster time to market due to accelerated development:
  • Increased customer (user) satisfaction, improved brand image, positive word of mouth
  • Decreased amount of unwanted functions implemented (savings in development and testing time and costs)

• Reduced aftermarket costs:
  • Fewer support calls, fewer returns due to mistake or misperceptions
  • Reduced training time, reduced user manual

• Increased revenue:
  • More orders per customer, more repeat engagements, more products per order
  • Better system acceptance, improved efficiency

The process of integrating HCD is divided into phases that are comparable with the phases of general organizational change process.
• The integration has very likely succeeded when it is a routine in the organization to seek a HCD process for the projects and when there are usability practitioners doing the work routinely [Schaffer 2004]

• Usability is successfully integrated into an organization when a strategy is developed which leads to key usability benefits and supports overall business objectives [Bloomer et al. 1997]
Defining Integration (2)

- HCD has been fully integrated into the organization’s operation when the following is true [Venturi & Troost 2004]:
  - The product lifecycle follows the principles of HCD at its every phase
  - The HCD team members have the skills and experience to follow the HCD process
  - Management supports it
  - The organization has proper HCD infrastructure
  - Awareness and culture are properly spread both in the organization and outside of it.
Success Factors for Integration

• Management support
  • Resources and the motivation for the change
  • Communication & giving possibility to partake
    • Why to integrate?
    • What is the goal?
    • How to reach it?
    • What is going to change?
  • Organizing, recruiting, giving roles and authority
  • ”Usability Champion”, ”HCD evangelist”
• Team/responsible person, possibly consultancy in the beginning
• Suitable process
  • Specific for the company
  • Project gates/checkpoints, schedules
• Suitable tools and practices
  • Handling and sharing information
  • Document templates, forms,
• Training

Jarmo Palviainen
When are We Integrated

• In R&D projects, there are several different stakeholders represented;
  • business management, marketing, user support, maintenance, assembly, mechanics & electronics & software & interaction & UI & graphical design, usability specialist, and the USER.
• Products have planned levels of usability => usability goals defined early in the projects
• R&D process supports good usability at its every phase
  • measurable requirements, methods, users participating…
• Sufficient in-house knowhow about design and user study techniques

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Established Usability Team

• “Evangelism”
• Training
• Guidance
• Standards & Templates
• Testing
• Metrics
• Responsibility & needed authority
• Reporting to the management
Usability Maturity Evaluation

**Usability Maturity** measures the capability of a development organization or process to generate usable outcome.

**Usability Maturity Model, UMM** is a reference model that is used to measure the capability of a development process to generate usable outcome.

**Usability Maturity Assessment, UMA** is a method to evaluate the current state of usability maturity of an organization.

The **main aim of UMA** is to improve the usability of the end product. High level of usability capability means that HCD is performed effectively and efficiently and the process systematically leads to usable products.

The practices in the usability maturity model, **UMM-P** that we have been applying, are based on the standard ISO 13407 and conform to the standard ISO 15504, the international standard for software process assessment.
## Usability Maturity Levels (ISO 15504)

<table>
<thead>
<tr>
<th>Level in ISO 15504</th>
<th>ISO 15504 description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V: Optimizing</td>
<td>The organization can reliably tailor the process to particular requirements</td>
</tr>
<tr>
<td>IV: Predictable</td>
<td>The performance of the process is within predicted resource and quality limits</td>
</tr>
<tr>
<td>III: Established</td>
<td>The process is carried out in a manner specified by the organization and the resources are defined</td>
</tr>
<tr>
<td>II: Managed</td>
<td>The quality, time, and resource requirements for the process are known and controlled</td>
</tr>
<tr>
<td>I: Performed</td>
<td>The process achieves its purpose. Individuals carry out processes</td>
</tr>
<tr>
<td>0: Incomplete</td>
<td>The organization is not able to carry out the process</td>
</tr>
</tbody>
</table>

To reach level 1 you need to perform 1.1 at minimum of 50%, to reach 2 you need to perform 1.1 fully and 2.1&2.2 at minimum of 50% etc.
## Usability Maturity Levels

*(Schaffer based on Earthy)*

<table>
<thead>
<tr>
<th>Level</th>
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<tbody>
<tr>
<td>V: Routine Usability</td>
<td>Usability has been institutionalized. It is a routine part of the dev organization. All the projects proceed with UE. The usability practitioners are accepted and understood part of design process</td>
</tr>
<tr>
<td>IV: Staffing</td>
<td>There is sufficient staff to handle the full set of dev projects. All projects are supported to an appropriate level. Generally about 10% of dev staff are usability practitioners (consultants, internal staff, offshore)</td>
</tr>
<tr>
<td>III: Infrastructure</td>
<td>There is a solid infrastructure for usability work, HCD is a constant part of R&amp;D process. There are reusable templates for every deliverable and common questionnaires. Design is consistent and efficient</td>
</tr>
<tr>
<td>II: Managed Usability</td>
<td>The organization has recognized the need for usability as a core capability. There is a coherent strategy for usability. A plan is made and followed to reach full maturity</td>
</tr>
<tr>
<td>I: Piecemeal Usability</td>
<td>Early adopters are trying to apply UE. There may be training, standards, evaluation and usability testing but no organizational commitment. The usability work can be very good but it is not managed nor integrated (no official status).</td>
</tr>
<tr>
<td>0: Clueless</td>
<td>The organization is unaware of usability as a formal discipline. Design is done by intuition and political argument</td>
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The Case Study

Case: Metso Automation

http://www.metso.com
Metso Innovation Process

Idea mgmt
Feasibility
R & D
Solution development
Review

Opportunity analysis
Opportunity identification
Concept definition
Idea selection
Idea generation & enrichment

Feasibility Requirements Design Implement Release

Development process

Front end

Research process
The Initial State

- The UM was around the level one; there was no official process for HCD, individuals carried out procedures if they had time in the projects.
- Lack of process led to lack of resources: HCD work had no budget and schedule.
- The need for organized HCD was clear and understood, the organization wanted it to have an official status.
- Many things had been done for usability for years, but not with allocated resources (e.g. contextual user interviews).
- The MAIP process was strictly followed.
## Issues Impacting on Integration Success

<table>
<thead>
<tr>
<th>Supporting issues</th>
<th>Preventing issues</th>
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</thead>
<tbody>
<tr>
<td>Good experiences with usability</td>
<td>Usability is not seen as a “high-priority” issue</td>
</tr>
<tr>
<td>Management support</td>
<td>Sticking to the old habits</td>
</tr>
<tr>
<td>An official status in the product development process</td>
<td>HCD is not seen as “real work”</td>
</tr>
<tr>
<td>Usability training</td>
<td>Applying HCD with agile methods is challenging</td>
</tr>
<tr>
<td>Controlling that the usability work will be done</td>
<td>Problems with resources</td>
</tr>
<tr>
<td>The role of the central usability group as a HCD leader</td>
<td>Recruiting actual and representative users</td>
</tr>
</tbody>
</table>

Source: interviews and survey in the development organization
The First & Big Steps

• To achieve an official status for the HCD work
  • Integrate HCD into the development process
• To categorize dev projects based on their usability criticality
  • To allocate and control the HCD work resources
• To train the staff about the HCD approach and methods
• To authorize the existing usability group
• To ensure the management support
• To systematize the gathering and exploiting of first hand feedback
Project Categorization

• All the development projects will be categorized in the project planning phase based on the usability criticality of their output
  • Usability critical projects
  • Usability attentive projects
  • Usability excluding projects
• To pass through the process gates, certain usability work has to be performed depending on the category
Examples of the criteria used when deciding the project category and the core of HCD focus

• how user interface centered the project is
• does the product have different user roles
  • different user needs
• how often the product is used
  • continuous: efficiency and satisfaction issues
  • occasional: easiness to recall
• how great the financial customer values are
• may a mistake in using the product put people or environment in danger
Usability Critical Projects

• The context of use has to be clearly understood
• The user is attending in the early phase of development
• Parallel design method has to be used
  • there clearly are two different design solutions in the early phase of development
• There is a planned feedback collection after the launch (6-18 months)
  • The development project group is allocated to analyze and learn from the feedback after the actual project is already ended
The New Process

<table>
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<tr>
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<tbody>
<tr>
<td>Feasibility</td>
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<tr>
<td>Requirements</td>
</tr>
<tr>
<td>Design</td>
</tr>
<tr>
<td>Implement</td>
</tr>
<tr>
<td>Release</td>
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</table>

- Feasibility:
  - Stakeholder meeting
  - Decision of the usability level
  - Analyzing feedback
  - User and context study

- Requirements:
  - Task analysis
  - Usability requirements
  - Personas
  - Planning feedback
  - Planning testing

- Design:
  - Parallel design
  - Prototyping
  - Style guide
  - Evaluation
  - Usability testing

- Implement:
  - Style guide
  - Best practices
  - Finalizing feedback

- Release:
  - Collecting feedback

Feedback

G0  G1  G2  G3  G4  G5
Institutionalized Process

Everybody is following the innovation process and is responsible for the usability of their own throughput.
The usability clinic is a group of experts and interested developers. They go through possible design solutions and discuss usability issues.

The executive usability group is the leader of the HCD work. It develops the process, metrics, templates etc. It organizes trainings and is responsible that everybody is able to do their share of the usability work.
Usability is everybody’s business but in the end, the usability group is liable of it as a whole.
The Next Steps

• Training for every role in the development organization
• Communicating the change more widely in the organization and out of it
• Building all the templates, questionnaires and metrics
• Checking the current state regularly (e.g. every 12-18 months)
  • Getting updated guidance, staying on the right track
• Nourishing the executive usability group
Changing the process and ways of working takes much time and requires high motivation and a clear goal. The organization has to have strong will to learn new methods and to be flexible enough to change the current thinking and challenge the current means to design.

The success factors: motivation, attitude and hard, systematic working towards a desired goal. Don’t be afraid to ask for help.
References

Bias & Mayhew 2005

Bloomer et al. 1997

ISO 9241-210 Human-centred design for interactive systems, 2010

Ketola & Roto 2008

Jokela 2008

Schaffer 2004

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