

**Report of Results – Research funding (Seed project), Maskinteknik i Oskarshamn AB and Jeff Winter (LNU)****Planned objectives**

The research project has been centred around the use of Participatory Design (PD) methods and techniques to further Maskinteknik AB's initiative to develop a custom information system to support the organization.

PD methods were used to involve the company's employees in the process of developing a requirements specification for the system. One important goal for the company was to make sure the end users (the employees) were engaged and included throughout the design and development process – in order to secure a better end-result and support the participation level. Another goal was to find an IT-developer and to start the development process of the IT-system.

From the research point of view, the goal was to develop and test PD-methods in an industry environment, which is not always considered as IT-intensive, and that has been somewhat neglected in the recent IT- and PD-research context. Another goal was to research how a small company can utilize PD-methods in order to face the challenge of digitalization: developing and adapting digital/smart/mobile solutions that are needed to meet the future demands from customers and partner organizations. The final goals were to co-author articles based on the results, and to secure funding for continuing both the IT-development and research efforts.

**Outcome – objectives and results****Introduction**

While the objectives and activities were carried out according to plan, the biggest challenge was to find larger chunks of time to complete the planned activities with Maskinteknik's employees. The time plan was therefore pushed several times, making the project time longer than first planned. Maskinteknik has experienced a very busy year due to an unusually high demand of our services. Since PD-methods were the focus of the research effort, it was important to include the employees in the process, often forcing us to delay activities during busy periods.

The additional time, has however, had a positive impact on the project as a whole. It has allowed for some ideas and initiatives to really sink in – making changes in the company's processes and routines easier to handle. Our employees have had the chance to discuss and try out ideas before deciding to include them in the development plan.

**Activities (information gathering, prototyping, program development)**

- We organized and categorized previously gathered information from activities that were carried out before the project started. The information was delivered to Maskinteknik AB in a document and has been used as a work-in-progress-document to track the results from the following activities.
- PD methods and techniques were planned and used to gather information from Maskinteknik's employees: observations, interviews, participatory workshops and various prototyping activities.
- A workshop was done with Maskinteknik's most important customer, SKB, to solicit their input on design ideas. The workshop was attended by project leaders from both Maskinteknik and SKB. Follow-up interviews were done with project leaders from SKB. SKB contributed with roughly 25-30 hours of their time.

- Student projects – Program “Interaction Design”
  - Spring-16, a group of five students, 8 week project around the module “Call off orders”, used for larger customers.
  - Spring-16, one student completed a degree project (Examensarbete) around the module “Purchasing”, used for tracking purchased materials, components and services from suppliers
  - Spring-17, a group of five students, 8 week project around the module “Project”, used for tracking information for individual projects
  - All student groups planned and performed PD-related activities, including workshops, interviews and observations. The students developed a number of mock-ups and prototypes that Maskinteknik has and will use in the continued work for developing the IT-system
- In addition to the activities (workshops, interviews, observations etc.) managed by Jeff Winter or the students, Maskinteknik has continued internal discussions and prototyping activities
- With help from Sven Westhoff, IEC, bidding documentation was sent out to several FileMaker developers. Several companies submitted bids and one company was chosen to carry out the development work.
- Meeting, phone calls and e-mail correspondence with the developer “Mallverkstan”:
  - Kick-start: Two day visit to Maskinteknik to start the work
  - Continuous phone and e-mail correspondence
- Prototyping of layouts by an Maskinteknik employee in the software FileMaker – to showcase ideas to Mallverkstan
- Development of the starter package “Seedcode complete” by Mallverkstan
- Collaborative authoring of publications

## Results

- Different PD methods and processes have been tested: observations and interviews, participatory workshops, mock-ups and various prototyping activities
- Part-goal solutions that support the transition to the new IT-system have been tested in context – both in the office environment (project leaders) and the workshop (machine operators)
- New routines have been implemented, communication and documentation processes have improved
- Detailed descriptions of work processes and routines have been written, based on interviews and observations. These have been an important input for building the new system, and have contributed to changing/improving daily processes in the company. The descriptions have also served as research information – building an understanding for issues that are typical of a small industry company
- Many iterations of paper prototypes have been developed by students and by the company’s employees. The paper prototypes have served as both communication tools to clarify wants, needs and expectations, and as physical layout suggestions that have been used in the development for the final product
- Mock-ups and prototypes of graphical interface/layouts that showcase the requirements of the system have been tested in MT’s workshop
- Layout suggestions were developed for several modules. Many of the layouts have been developed in UX-Pin – a prototyping program for graphical representation
- Feedback has been solicited from the company’s employees in response to developed mock-ups and prototypes. Information was recorded and categorized in a document.
- Problems and issues that the employees experience with the current system and company processes have been documented – some of which have led to immediate changes in company processes, while others have been used as input for the new system

- Feedback from Svensk Kärnbränslehantering AB (SKB) contributed to important information regarding functions that need to be included in the new system. While the program is under development, a new, temporary template was developed to meet their wants and needs from us as a customer (new excel document for tracking jobs and financial information and a new routine for sharing financial information with their project leaders was put in place)
- The project has resulted in a much larger participation and engagement level from Maskinteknik's employees than "usual". Normally only the owner and a couple of people are involved in internal company development work. In this project, all employees have been involved to some degree in the development process. This has led to results and benefits not related to the actual development of the IT system. Employees have submitted much more feedback (positive and negative) to the company owner regarding the company's operations. Employees have taken initiative to develop their own solutions that improve upon the company's processes.
- We have used the information gathered from the research to plan and design the expansion of our company. Most importantly, we are in the process of planning a new building for more offices and workshop area that will incorporate many of the process- and design ideas that have resulted from the project.
- The project has created a whole new way of thinking about digitalization in our company. While the new system is at the heart of that transformation – the ideas and solutions that have surfaced have really been about the company's processes in general. The PD-methods have forced us to really think of how we can involve our employees not only in the process of developing the new system, but also how they can be involved in the company's processes and decision making in a new way going forward.
- Other mobile solutions have been implemented to support the new IT-system under development, for example:
  - The company has switched to a mobile solution for the phone system
  - Decision to invest in new smartphones and tablets have been made (will be purchased in fall 2017)
  - A new e-mail and hosting system that works better with the new IT-system will be implemented

### **System development**

- Several FileMaker companies were invited to bid on the project. The company "Mallverkstan" was selected to start the development work
- Development of the IT-system applications/modules has started. Mallverkstan has worked on making changes to the FileMaker starter package "Seedcode complete". Most of the initial work was setting up the relationships in the "back end" of the system and communicating our requirements. One module is near completion – time reporting.
- Maskinteknik will continue the development work with Mallverkstan

### **Research and Publications**

- Published research paper: "Teaching PD – learning from a small industrial project". Co-authored by Jeff Winter, LNU och Linda Sharp, Maskinteknik AB.
  - Presented by Jeff Winter at the Participatory Design conference (PDC'16) in Copenhagen, August 2016
  - A total of 61 short papers were submitted, only half went on to round 2, and only 14 were accepted and published, (roughly 23%)

- Research information/results was categorized into several themes for future articles in the areas Interaction design, Participatory design, Pedagogy (Teaching PD), Prototyping
- Writing of the next article(s), based on the results from the Seed project, has started
  - One article will focus on prototyping as a tool in PD-methods (using paper prototypes, mock-ups, UX-pin prototypes etc. as a tool for communication, and participation when developing an IT-solutions
  - The article will be submitted to one or more of the following:
    - ACM GROUP 2018 2 /10, 2017 (Working paper)  
<http://group.acm.org/conferences/group18/>
    - PCD 18 (Full paper) 10/10, 2017  
<https://pdc2018.org/>
    - HCI Europe 2018 31/1, 2018  
<http://www.wikicfp.com/cfp/servlet/event.showcfp?eventid=65271&copyownerid=26030>
    - PDC 18 (Short paper) 9/2, 2018  
<https://pdc2018.org/>
  - May result in more than one article

### Other

The project has been featured as a "Good example" in public speaking engagements and panel discussions, for example:

- Panel, Regiondagarna, 7/10, 2016: "How shall Kalmar Län act to be in the forefront of the digitalization wave"
- Presentation, Innovationsdag Småland, 26/10, 2016: "Innovation through collaboration"
- Presentation, Kick-start digitalisering (anrdnat av Teknikföretagen, RISE, IUC Kalmar Län, IF Metall, Fiber Optic Valley), 16/5, 2017: "Digitalization – practical examples"

### Future funding

- When the seed project started, an application to KK-stiftelsen had j ust been submitted (Reseracher: Jeff Winter, Project participants: Maskinteknik, SKB and Atlas Copco, Kalmar). We received a decision in May 2016 that the application would not be funded.
- Application submitted to Vinnova "Ökad innovationsförmåga genom nya samverkansmodeller för små företag " (Increased innovation ability through new collaborative models for small companies)
- We are actively looking for funding options to continue the research collaboration with Jeff Winter

In summary, the project has had an incredibly positive impact on the company! The seed funding allowed our small company to work closely with a researcher to find and adapt PD-methods that worked for developing the requirements specification for the new IT-system and company processes.

Without the Seed funding from IEC, it is very likely that we would have given up on developing our system a long time ago. The research effort has been both a "carrot and a stick" – motivating us to continue, and forcing us forward during times when it was hard to find the time to work on the development initiative.

By having PD-methods as an anchor, we have been forced to think about both why and how we are involving our employees in the process. We have learned what works, and what doesn't work – in regards to both what type of information they can and want to provide, and what level of engagement is most effective.