FROM DESIGN EDUCATION TO USER-DRIVEN INNOVATION AND BACK AGAIN

Christian TOLLESTRUP and Kaare ERIKSEN
Aalborg University, Department of Architecture, Design and Media Technology, Denmark

ABSTRACT
Can distilled design methods for non-designers to user-driven innovation inform design education of Industrial Designers? In 2010 a project on employee driven innovation in the Hospital Sector with Aalborg University and Aalborg Hospital provided 35 participants from all over the hospital with a very condensed ToolKit for user-driven innovation based on Design Thinking. Part of the ToolKit was then used in a course for 3rd semester Industrial Design students to investigate whether these tools also could be used to introduce design students to basic methods. The methods range from observation of potentials and problems to systematic ideation. This paper compares the use these methods in the two settings and especially the problem framing is problematic for both employees and students. For each method strengths and weakness in both situations are outlined. Finally it is concluded that the experiment of taking the tools made for employee-driven innovation back into the education stage without any change and without the full-facilitated support from the project setting shows that introducing tools without the mind-set is challenging the very value of these tools.

Keywords: Tool kit, user-driven innovation, systematic ideation

1 INTRODUCTION
User-driven innovation has been a hyped phenomenon in the past decade and many research projects have been carried out focusing on how to involve users in innovation processes. The latest round of user-driven innovation project funding from the Danish Business Authority slightly shifted this focus to Employee-driven innovation with the intent to harvest the practical hands-on knowledge and ideas from employees from a perspective inside the organization.

1.1 Employee Driven Innovation
In 2010 Aalborg Hospital and Aalborg University carried out a project focusing on how to promote Employee-driven innovation with a Design approach and Design Thinking. Already having established an Idea-clinic and having an Innovation department Aalborg Hospital was very focused on how to broaden an innovation-oriented approach and mind-set to a larger part of the organization.
The project was named MIPS (Employee-Driven Innovation in the Health Care sector) and involved 35 participants from all the different departments at the Hospital, including Kitchen staff, Cleaning staff, Nurses, Surgeons, etc. Over a period of 8 months the participants were introduced to Design Thinking through a series of 6 full day workshops giving them hands-on tools to engage in the first steps of a development process with an open-minded solution oriented approach. Part of the project result was a MIPS Toolkit [1] with simplified Design methods in a process derived from a general version of Design Thinking like unfolded by Thoring & Müller [2]. Furthermore it was inspired by both the professional practice approach and experience from teaching design methods and processes within the Industrial design program at AAU. The ToolKit range from spotting potential opportunities and problems to be solved, over structured elicitation of requirements, structured ideation and conceptualization to making physical mock-ups and communicating the ideas and concepts developed.

1.2 Introducing Design methods to Design students
At the Industrial Design Engineering program a recent restructuring offered a new opportunity to teach Industrial Design already from 3rd semester as opposed to 5th semester previously. This inspired the idea to test the MIPS Toolkit on these relatively less experienced Design students to see if these distilled design methods for non-designers to user-driven innovation could inform the design

education in terms of way we are introducing basic tools and the problem-solving approach of the design profession. Over a 2-day session a part of the ToolKit were introduced and rehearsed with 30 design students at their 3rd Bachelor Semester in October 2011.

2 DISTILLED DESIGN METHODS

The ToolKit is based on Design Thinking and practice with inspiration from the quick and dirty ethnography used by design studios [3] and teaching material for design students on how to ideate and sketch through a design process. Each tool was made as a fairly simple template ready for use.

The methods from the Toolkit used both with employees and students were "The Elevator", "The Carrousel", "Goal" and "Systematic Ideation". This covers the process from eliciting the initial requirements, unfolding the problem space, focusing and prioritizing problems, framing the main problem and start developing initial proposals for solutions.

2.1 The Elevator

Inspired by the interview technique often used in situated interviews and based on root cause analysis [5]; "The Five whys" one of the initial actions when facing a potential problem is to try to understand if there are underlying motives, motivations and desires behind an observed phenomenon or problem. A classical deconstructive approach to break down the perception of the problem space and investigate whether the observed problem is a "real" problem or a symptom of another, and more important, problem seen from a systemic thinking perspective [4]. This was condensed to "the Elevator" as a symbol on the vertical axis showing that a problem pertains a certain "floor", but it may be related to problems on a higher level of abstraction or larger context at another "floor".

Using "The Elevator" requires specific roles, namely and interviewer and an interviewee, where the interviewee preferably have contextual knowledge regarding the problem to be investigated. The process is to ask why this observed problem is a problem and subsequently ask why the following answers in order to unfold the related problems and values of the interviewee. (See Figure 1, left side)

Figure 1. The Elevator and The Carrousel OBS ERSTAT MED INDHOLD

2.2 The Carrousel

Having explored the problem on the vertical axis one should get of at the most relevant "floor", thus pick a level where the problem should be addressed. At any level there would be related sub problems when looking at different aspects such as production, sales, use, storage, system interface, etc. "The Carrousel" was the metaphor for the horizontal problem unfolding activity that designers do to understand the relevant contexts such as the client/manufacturer (like in a Design Brief) and the use context (observations/interviews/market scan).

To provide the user of "The Carrousel" with some guidance as to which aspects one could unfold the problem into a short list of areas and sub-areas was provided along with the template. Using "The

Carrousel" requires a point of departure, a statement of the initial problem that could be derived directly from the level in "The Elevator" that were chosen. Subsequently sub problems and areas are noted around the circle physically unfolding the problem on the horizontal level. (See Figure 1, right side)

2.3 The Goal

When the problem space have been investigated and challenged by divergent actions both vertically and horizontally it is time to converge again and focus. To help do this a simple Goal template is used to frame the problem in a relatively short, open and positive statement. The difficult part if to create enough "direction" with the statement without it being to narrow and thus limiting the solution space too much. Listing the most relevant requirements and wishes sorted by topics below supports the defining problem statement.

2.4 Systematic ideation

By breaking down the problem into a list of requirements it offers an opportunity to start the problems solving by focused ideation in a step-by-step procedure. Instead of facing a multitude of complex demands and requirements it is much easier to start by focusing on only one sub problem at a time. The Systematic Ideation template is the rigid version of normal ideation activity where the design only deals with selected problems and areas at a time, but fluctuates between detail and the holistic overview to ensure consistency and gradually integrate more and more part solutions into the entire solution. However introducing problem solving by structured ideation is an attempt to introduce the focused part of ideation. Using The Systematic Ideation template, start with 4 requirements from the Goal Template. These are listed in the first column A and subsequently the user tries to solve each of these problems. In the next column B with two slots, the solutions from column A are combined and further develop. So B1 is the combination of A1 and A2 and B2 is the combination of A3 and A4. Finally B1 and B2 are combined into column C (see Figure 2) This gradually larger area for sketching take into account the increasing complexity and each step requires an evaluation of the proposed solution stating the positive and negative aspects of the proposition, taking this into account in the following integration to maintain the positive aspects and minimizing the negative ones. The template only has room for 4 requirements at a time, but it only serves to demonstrate the principle, and more templates can be combined or skipped entirely to continue "outside" the rigid structure.
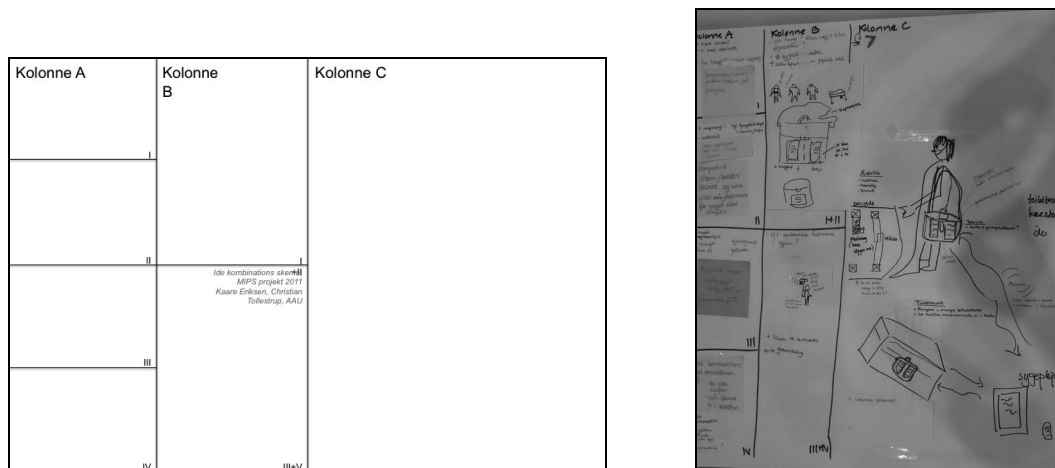

Figure 2. The Systematic Ideation Template and example

2.5 Facilitation and support

The setup between the two groups was different in several ways. Two researchers and a 6th semester Industrial Design Students facilitated the use of the templates and especially the visualization part of the systematic ideation facilitated the MIPS project. The MIPS project had 3 full day workshops for dealing with this part of the ToolKit where they worked in groups of 3-6 people with contextual knowledge on the subjects.

The 3rd semester Industrial Design students had the same two researchers to facilitate the process, there were no additional support and they worked in pairs or individuals during and had constructed problems to deal with.

3 RESULTS OF USING THE TOOLS

With both groups, the employees and the students, the use of the ToolKit revealed some severe limitations of the relatively rigid tools. When comparing the two situations one should observe that there is a difference in the framing of the tools. In the MIPS project the participants where introduced to the whole concept of development and a process with tools. Bringing these tools back into an education context a framing already exists and they have a little pre-understanding of what the design field is about and does not expect the design approach to be so simple and explicitly structured.

So, some of the differences between the two groups concerning some of tools may relate to the background of the two groups and the setup.

3.1 The Elevator – a stairway to heaven

Using "The Elevator" as interview guide proved to be more difficult than expected, as the interviewer did not know exactly what to expect or where focus the question. This often leads down to dead ends where the ultimate reason for doing something is "to be happy" or in case of the hospital personnel the ultimate goal was often "patient satisfaction". Focusing on the potential in an answer can apparently be tricky as this example shows. The problem observed was damage to corners at the entrance to some rooms. Answer to the first "Why" question was "Because the beds sometimes hit the wall" and the subsequent answer to the next "why" was "Because it can". The interviewer and interviewee focus on explaining functionality factually and stringent, not trying to broaden the scope with more guiding questions like "Why does this occur?" that focus on behaviour of people rather than functions.

The same tendencies were observed with the student group; they did not guide with their questions or were inquisitive but rather followed the functionality than reasons for behaviour. Without the guide of more experienced problem framers the students seemed less likely to deviate and improvise.

The result of using "The Elevator" proved to be less useful and not unfolding the problems to much more than 2-3 levels before coming to a halt or reaching the ultimate reason.

3.2 The Carrousel – focus on safe ground

Using "The Carrousel" was not a success in terms of unfolding many different aspects around the initial problem. But here there was a difference between the two groups in the part they focused on.

The employee group was mainly focused on the use aspects, including things like storage and cleaning but had great difficult saying anything about market and production. An example on unfolding problems concerning a transportation device for drinks (for patients) 4 of 8 comments in "The Carrousel" was on aesthetics like "It is ugly, unhygienic and messy" and "you can't see who it is for".

The student group was more focused on functionality and generally more spread, but had less user-oriented aspects than expected.

The general tendency seemed to be that the participants stayed on safe ground where they knew something about the aspects in advance. E.g. the employees focused on their immediate context and the aspects they knew or cared about. "The Carrousel" tool itself did not force the user out of the comfort zone.

3.3 The Goal – a good requirement is hard to get

Reaching the Goal with a useful Problem statement and supporting requirements also proved difficult. The group of employees had no previous experience with problem-based learning and required a lot of facilitation and examples on problem statements from facilitators during the workshops. As a result of the difficulty with reaching the right level, number and amount of details on the Goal template the MIPS project had to use 2 workshop days on this instead of only one as planned. Still problems were framed very short like "Better seating for waiting room", again focusing on functionality and objects instead of "Improve the waiting experience for patients and relatives". With requirements following the same broad type of statements like then problem framing it became very hard to measure and use these for guiding later ideation and evaluation.

The student group had previous experience with problem framing but were struggling very much with specifying useful requirements, in view of the shorter time for this group the teachers had to step in and create new demand for the constructed problems in order to be able to move on to ideation.

3.4 Systematic Ideation – integration requires training and training
The employee group from the MIPS project had direct support from experienced design students during the systematic ideation that helped the progress and process especially with the visualization part. But the systematic approach it self was easily understood even though the integration aspect was hard to cope with in terms of building the part solutions together without just directly bringing without developing the idea further. It had tendencies to overload with features as more requirements should be dealt with, e.g. ID bracelet for patients with GPS tracking, RFID identification, Data storage, etc.
The student group had an easier time using the structure, as sketching was already part of their competencies. Also the integration aspect created fewer problems, even though the short time for this part during the course put them under time pressure for finishing. However a follow up 3 weeks after the course module when they were in their project period showed that very few of the students had embraced the structured technique for ideation in their own projects.

4 MAIN PROBLEMS
The two situations also represented different objectives for the participants to use the ToolKit. For the employee the objective was to provide the participants with a set of simple set of tools they could use after the workshops and rehearse the use of these during the facilitated workshops. Even though the use of some of these tools proved difficult they were very motivated to try them out. In an overall reflection on the MIPS project they were very positive about the attitude and mind-set change that the project provided and in hindsight less focused on the actual tools.
In the education setting the objective was to provide them with skills in terms of hands-on to unfold problems, state requirements and systematically ideate on the solution. The course setting did not provide an opportunity to present a package solution with mindset and coherent tools. This was just one small contribution in a much larger educational setting.

4.1 Problem framing
For both situations the knowledge about the context was influencing the focal points. The students had not yet enough experience in framing problems with requirements that they could exercise empathy and imagination enough with a situation they had not experience directly. Even thought at least on of the problems constructed by the teachers was within areas they easily could have experienced; e.g. beach tour equipment. Framing the problem with direction and still open requires repeated training and experience with how it closes or opens the solution space later in the process. Stating a requirement so it actually can be measured or interpreted was not part of the template or lecturing and the 3rd semester students did not have enough previous training with this part.
Design as a holistic practice where it is very difficult to go around the whole range of problems and perspectives/view points in short amount of time if you are not experienced in these aspects or have developed the empathy to jump into a certain point of view, primarily the users in the case of students.

4.2 Focus on the procedure, not the objective
As one can see from the use of "The Elevator" it is difficult to use them without previous experience as to what insight interviews can lead to. At the same time both groups of users took the rigid and simple instructions very literate and hesitated to deviate from the template. They did not enter into a more fluent interview where the "why" is more of a guideline of seeking the underlying values and intentions of the interviewee. The template apparently dictated the use and behaviour and restricted improvisation. The same restriction was not observed using "The Systematic Ideation" template. It may relate to the facts that they could choose which requirements to use and that the template was not pre-printed but constructed by participants them selves on blank pieces of paper.

5 CONCLUSION
So can distilled design methods for user-driven innovation inform design education? In some ways yes; concerning the use of simple tools it can be too simple a structured procedure does not in it self enable the design process for design students.

The very simple version of the guideline approach [6] that the MIPS project provided did not ensure design students reaching the goals and fulfilling the expectations from their teacher in framing problems and creating ideas to solve them. The ToolKit was presented to students outside the context of the MIPS project and the lack of contextual support with additional lectures on how to approach design may have limited the understanding and use of the ToolKit. But it does seem that even though structured methods can prove useful for novice designers and design students the lack of experience with what the potential outcome could be or the underlying objectives behind the method inhibit the students in embracing the principles of the methods.

The experiment of taking the tools inspired by teaching methods and made for employee-driven innovation back into the education stage without any change and without the full-facilitated support from the project setting shows that introducing tools without the mind-set is challenging the very value of these tools. The fluidity of the holistic approach and knowing when to break the rules (procedures) is crucial when dealing with templates that can be interpreted as very strict and formalistic.

Next time the 3rd semester students are introduced to framing and ideation tools, the objectives, values and variation will be a priority. More guidance and practical example on *how* the methods and tools can be used demonstrating a variety and allow, even ask, for improvisation is needed if the students are to embrace the underlying principles.

REFERENCES

[1]   Tollestrup C. and Eriksen K., *MIPS værktøjskasse.* 2011. ADFiles Vol. 50, Department of Architecture & Design, Aalborg University, ISSN 1603-6204.
[2]   Thoring K. and Müller R.M. Understanding Design Thinking: A process model based on method Engineering. In *International Conference on Engineering and Product Design Education EPDE 11*, City University. London, September 2010, pp.493-498 (The Design Society, Strathclyde).
[3]   Kelley T. *The Art of Innovation*, p.23-52, 2001 (Profile Book Ltd., London).
[4]   Senge P.M. *Fifth Discipline, the art and practice of the learning organization.* 1992 (Century Business, London).
[5]   Pojasek R.B. Asking "Why?" five times. *Environmental Quality Management;* Autumn 2000; 10, 1; ABI/INFORM Trade & Industry pg. 79.
[6]   Stolterman E. *Guidelines or aesthetics: design learning strategies. Design Studies Vol. 15 No. 4.* 1994.