FACILITATING CREATIVE PROBLEM SOLVING WORKSHOPS: EMPIRICAL OBSERVATIONS AT A SWEDISH AUTOMOTIVE COMPANY

Katarina Lund[1,2] and Johan Tingström[2]
(1) KTH Royal Institute of Technology, Sweden (2) Scania, Sweden

ABSTRACT
Being creative often includes putting ideas together in new combinations and approaching problems in new ways. It is a process which can be difficult and frustrating since it demands that we challenge our usual ways of thinking. Facilitation is one means by which we can be aided in the process of breaking our thought patterns, and thereby reach further in our creative efforts.
This paper describes the planning, execution, evaluation, and consequent lessons learned from the facilitation of two creative problem solving (CPS) workshops. In these workshops four different groups addressed problem solving with a set of innovation tools and the help of a facilitator.
Our conclusion is that a product development team, working interdisciplinary on CPS may benefit from facilitation in different ways. We saw that facilitation can, for example help create mission clarity and counteract behaviour that may otherwise inhibit the participants' ability to come up with and share ideas. We also saw that entering a workshop with misleading preconceptions of workshop atmosphere may lead to insufficient time being spent on exploring potentially creative ideas.

Keywords: Innovation, workshop, idea generation, facilitation, creative problem solving

1 INTRODUCTION
New product development is since long known to be of utmost importance for a company's competitive advantage [1], and turning new products into innovations requires deliberately searching for and identifying innovation opportunities [2]. At the heart of every innovation lays a creative idea, and innovation is a successful implementation of such an idea [3]. In order to get creative ideas you need creative people, therefore creative employees is a critical ingredient in any company with aspirations of being innovative. Assuming that creativity can be learned [4], and creative behavior can be affected by external factors [5], many interesting implication both for practice and research emerge.
A wide range of means to influence creativity have been described in the literature ranging from tools [6] and organizational culture [7] to emotions and motivation [8]. Another such means of influencing creativity is CPS workshops. Companies use CPS workshops to develop creative abilities in the organization [9] and thereby increasing its chances of developing innovative products. In a group, participants from different professional backgrounds can serve as a stimulus to innovation [10], and CPS is often conducted in the format of workshops with interdisciplinary teams.
In the field of CPS there have been many studies conducted on for example creativity methods [11] and group composition [12]. An area that has been given far less attention is that of facilitation. The purpose of this paper is to explore how facilitation can help generate fruitful results in CPS workshops. It also describes the evolutionary development of a CPS workshop format.

2 THEORETICAL BACKGROUND
The design of products and services is a process with lots of uncertainties and ambiguous input [13]. Often there are no clear answers, but success is rather determined by subjective user evaluations and sales numbers [14] - feedback that may reach the developers after most possibilities of product changes have passed. A well-defined development process is beneficial for the quality assurance, coordination of project activities, planning and scheduling of team members' time, and improvement identification [15]. There are many different models of development processes available, and most companies develop their own variants, but there are often some common elements. In an attempt to identify commons elements for product development processes Ulrich and Eppinger [15] presented a generic product development process consisting of six phases; planning, concept development,

system-level design, detail design, testing and refinement and production ramp-up. This generic model can be found in most companies that develop products.

2.1 Creative problem solving

The concept generation phase of the generic product development process have a lot in common with Osborn's seven-step CPS process [16] (as reproduced in [9]). He suggests that CPS consists of Orientation, Preparation, Analysis, Hypothesis, Incubation, Synthesis and Verification. Since Osborn's book there have been suggestions of modifications to this seven step model, see for example Isaksen and Treffinger (2004) [9]. CPS has been described as a *"process model which can be used to define or formulate problems, generate ideas, and refine solutions for implementation"* [17] (p.149). It is an important part of the product development process and maybe the part of product development that is most dependent on creative ability of the people participating. Creativity is about how people approach problems and use their ability to put existing ideas together in new combinations thus creating new solutions [5]. Creativity is not an activity granted a limited group of people born with a creative mind, but is an activity we all can learn [4]. But, to be creative we need to challenge our ways of thinking and force ourselves to look at a problem in novel ways [4]. As Badke-Schaub (2007) states: *"To be creative is not an intuitive answer to an inspiration from nowhere. It is the result of thinking broadly about an issue, of modifying and rejecting known and accepted ideas and it is a matter of intrinsic motivation."(p.359) [4]*.

Challenging our usual ways of solving problems is well captured in the expression *"path of most resistance"*, a counterintuitive approach to innovation [18]. The idea is that going against the intuitive ways of thinking, with the help of a systematic process, may increase our chances of coming up with creative ideas [18]. In this paper we will concentrate on the group based use of creativity techniques in facilitated workshops.

2.2 Workshop setting and interdisciplinary teams

Facilitated workshops, with the purpose of solving technical problems is a common work method, used both as an integral part of company operations and by the means of external consultants facilitating workshops around specific problems [18]. A workshop is a meeting where people work together to reach a joint result, and can comprise all phases of a problem solving effort. A workshop often revolves around a specific problem which needs attention and the aim is to make use of the creative potential in a group in a short, concentrated effort [19].

Workshop groups often comprise an interdisciplinary team who share a common problem. Interdisciplinary teams typically include competences like engineers, designers, marketing personnel, manufacturing experts, purchasers and possibly users [20]. Interdisciplinary teams can serve as a stimulus for both innovativeness and product quality, and a structured design processes is one example of how you can support interdisciplinary integration [10]. Facilitation is another way you can enhance the chances of the different disciplines understanding each other and communicating successfully. Like VanGundy states in his book from 1992 [21]: *"Facilitators can be the cement that bonds a group together and ensures productive outcomes."*(p.37) (source: Nelson and McFadzean (1998) [22]).

There are many examples of how you can involve users in design activities, ranging from users seen as informers to users seen as partners and co-creators [23]. Involving users provides new challenges for the roles to be taken by the designers or project leaders. A threefold role as a developer, facilitator and generator, has been suggested [24].

2.3 Facilitation of creative problem solving

Facilitating group activities with the goal of CPS has been described by for example McFadzean and Nelson [25] where they underline the facilitator's importance not only during the problem solving activity but also in the preparatory work as well as after the workshop has taken place. A facilitator should possess a number of qualities to be able to fully support a group based problem solving effort, such as understanding of problem solving theory, communication skills, friendliness and the ability to elicit information [22]. Other facilitator competences suggested are the ability to mediate between persons, ensuring that everyone takes part in the discussions and the ability to look at a design task through the eyes of others [26]. It has been shown that groups with a facilitator perform better than groups without a facilitator in certain settings [27].

Another stream of literature interesting for our study is that of creative climate. A creative climate is identified by for example challenging work tasks, and a work environment characterized by constructive debate and playfulness [28]. Appraisal for new ideas, a sense of focus and direction, and an organizational support for innovation are other factors that describe a creative climate [29]. For temporary group setting like that of a workshop, it is misleading to talk about climate. There are nevertheless a few of the creative climate factors that are related to sought after facilitator competencies, such as the ability to establish trust, having a sense of humor and intellectual agility, as well as being able to question and clarify what has been said [22].
The leadership style can have a notable impact on the creative climate, and this applies not only to managers, but also informal leaders and experts [28]. A facilitator when participating in a group based problem solving setting can be seen as one example of such an informal leader. Since creative climate has an influence on the processes used to generate creative outcomes [28], facilitation should strive to accomplish an atmosphere that share the characteristics of a creative climate.
The implications for facilitation in practice that the above mentioned aspects of CPS may have create the focus of this paper.

3 METHOD

This study explores how facilitation can help generate fruitful results in CPS workshops. The analysis and evaluation of the results (i.e. the technical concepts) from the workshops, is left out of the scope of this paper.

3.1 Research setting

This study was conducted at the R&D department of a large automotive company in Sweden. At the time of the study the company had its head office, and the majority of R&D, purchasing and marketing in the same city in Sweden, while the production and dealer organization were distributed internationally. The R&D department was characterized by a strong functional organization, where people were co-located based mainly on which part of the product they work with.
At the time when the workshops were held there were a number of employees within R&D that had facilitating workshop as a part of their regular work tasks. For this study three facilitators were used. One of the facilitators was a part time PhD student, part time innovation coach, where the job as innovation coach mainly consisted of facilitating workshops of the kind described in this study. The second facilitator was an engineer conducting a research project about innovation capability at the company. The third facilitator had a position to deploy efficient and innovative methods in the R&D department. The facilitators were not experts of the technology in focus, but gained a basic understanding for the problem prior to the workshop by talking with mechanics and engineers familiar with the problem. All facilitators have a degree in Mechanical Engineering. Two of the above described facilitators serve as authors of this paper.

3.2 Study design

Problem solving workshops can be designed in many different ways, and the design of the workshops in this study has been loosely inspired by CPS processes, like that presented by Isaksen and Treffinger [9]. The main steps in the process are; Problem space identification and orientation (conducted prior to the workshop), Problem definition, Idea generation, Idea evaluation, Concept generation, Concept exploration, Concept evaluation, and Concept selection.
The two workshops that create the base for this study were carried out within a seven months period. From this point in the paper “the first workshop” will refer to the workshop held in April and “the second workshop” will refer to the workshop held in October. These workshops included seven or seven and a half hours of group work and a minimum of seven participants.
The idea to hold a group-based workshop around problem solving was initiated by members of the organization. These problem owners approached one of the facilitators with an idea of a problem area that needed focus. The goal of the workshop, limitations of the problem scope and group composition were part of the discussion between problem owner and facilitator prior to the workshops. In some cases changes were made as a consequence of those discussions.
The participants were selected among people working with the system under reconstruction. At the first workshop the participant list comprised five development engineers, three senior development engineers, three assignment managers, one field quality engineer, two mechanics, and three test

engineers, who were split into three groups. At the second occasion the participant list comprised four senior development engineers, one ergonomist, one system architect, and one project manager. In addition some managers participated in parts of the workshops, mainly giving feedback or partaking in decision making. At both occasions users participated in the introductory parts of the workshops, serving as a voice of the customer. Hence we included users as spokespersons for users as a group, but chose not to include them as co-designers as has been suggested in literature [30]. The reason for this was mainly practical, springing from the problems owners' suggestions of level of user participation, availability of users and the maturity level of the problem at hand. We are, however, open to the possibility that future workshops could benefit from including the users also in the creation process.

During the actual group session the facilitators were guided in their work by instructions in a facilitator handout where each of the different parts of the workshops were described. The handout included instructions about the tools and methods to be used, and a description of the facilitator's role in each part of the process. The description of the facilitator role included for example *"make sure everybody participates"*, *"try to create a good group climate. If the group works fine on its own you may take a step back and keep a low profile"*, *"encourage people to build on the ideas of others and discourage 'ownership' of ideas"*, and *"try to pick what's conceptually good out of the wild ideas in order to find more realistic applications"*. The set of tools described in the facilitator handout were for example five whys, and context mapping for the problem definition part, Brainstorming for the idea generation part, and SWOT analysis for the evaluation of ideas [31]. The facilitators were free to use the methods they found appropriate for the task and group situation.

A few days after the workshop was completed an evaluation questionnaire was sent to the participants asking them about their subjective opinion about the work format, their own performance, and that of the group and the facilitator. The rating was done on a scale of one to five, where five was the best and one the poorest. In the first evaluation the participants also rated the quality of the ideas selected. Since no selection procedure was included in the second workshop that question was omitted from the evaluation questionnaire. The evaluation also asked for written feedback of the way the workshop was planned and carried out, with the purpose of improving future events of the same kind. At the first occasion it was possible for the participants to answer the questionnaire anonymously by printing it and sending it by internal mail. All chose to send it by email, thereby giving away their identity, and therefore that method of submission was the only one offered at the second occasion. In addition to this written participant evaluation the facilitators met to reflect on their respective experiences from facilitating the workshops.

3.3 Research approach

The methodology in this paper is based on action research. The methodology complies with the characteristics of action research as described by Coughlan and Coghlan [32]. The research was carried out as a self-observation study of an organizational activity carried out within the frames of normal company operations. This method of working was under development and the lessons learned from the workshops together with the feedback from the participants served as a basis for further development of the workshop format. As Coughlan and Coghlan [32] describe, action research takes place in a cyclical four-step process; *"planning, taking action and evaluating the action, leading to further planning and so on"* (p.223). This cyclic process is the model in which the work format used in this study has evolved. Feedback from the first workshop was implemented and tried out in the second workshop. The study was participative in the sense that the researchers participated in the work format under development, and the opinions of the other participants were crucial for how the work format evolved over time. The results from the workshops were twofold, firstly the concrete concepts that solved the problem central to the workshop, secondly knowledge and experience valuable to future similar events and the further development of the workshop format.

Moreover, the research conducted in this study falls within the definition of insider research as defined by Brannick and Coghlan [33]. They define insider research as *"research by complete members of organizational systems and communities in and on their own organizations"* (p.59). The facilitators conducting the workshops are to be regarded as complete members of the organization, and the study was carried out using authentic problems. The work format of interdisciplinary workshops including facilitator is accessible as an integral part of the organization and none of these workshops were conducted for the mere sake of research.

4 RESULTS

The results section describes the two workshops, from planning to execution and evaluation. It is presented in chronological order with feedback from the evaluations integrated in the parts the comments referred to. All quotes were translated from Swedish to English by the authors, and in cases where specific words to describe the user or the system under reconstruction was used, the phrasing was changed into “user”, “product” or the alike.

4.1 Planning and preparing the first workshop

Facilitation started a few weeks before the actual workshop was held. The planning phase comprised of two kinds of activities. Firstly, the dialogue with the problem owner, to understand the expectations and goals of the workshop. Facilitation included tuning in on the vision of creativity level that the problem owner had and to adapt the workshop format accordingly. Secondly, the planning of the workshop activities and the tools and methods suitable for each part of the process. That second type of planning was documented in a workshop schedule and the facilitator handout.

4.2 Execution of the first workshop

The workshop was carried out over the course of a full day with a one hour lunch break, and two smaller breaks (Table 1). The purpose of the workshop was to solve a problem with the existing product, with the goal of coming up with concepts that could quickly be brought to the market. Three main problems were identified as focus areas and three groups, one for each problem, were formed.

Table 1. Schedule for the first workshop occasion.

	Task
8.30	Introduction to the workshop and the problem
9.30	Background review and problem definition
10.15	Break
10.30	Idea generation
11.30	Lunch
12.30	Sorting, prioritizing and developing ideas
13.15	Selection of five ideas for further development.
13.45	Break
14.00	Further development of ideas and prototyping
14.45	Selection of two concepts, evaluation, preparation for presentation
15.30	Presentation of selected concepts to managers. Selection of concepts for further development.

As a message that this workshop was of importance to the organization, and to motivate the participants to fully engage in the problem solving efforts, an engineering director held the introductory presentation. It was also clear from the start that this engineering director would participate at the concept selection in the end of the day. This was commented on in the feedback by one participant who stated that *“with the introduction of the engineering director there is a more clear focus on the problem and it gets priority”*. Furthermore, two users were invited to tell their view of the problem. One participant stated in the evaluation that this had effect by saying that *“hearing stories from the users, about problems experienced in the field gives you an understanding that it really is an issue and not just a poorly written text in the field quality report system”*.There was however not much room for dialogue between the users and the participants.

To ensure a feeling of participant ownership of the problem at hand, one hour and forty-five minutes was spent on introduction and problem definition. Participant feedback, such as *“I liked that we clarified the background to the problem, because even if you thought you knew the background this created a common view within the group”*, underline the importance of this part of the process.

Creative problem solving tools, were used in the idea generation phase of the workshop, with the purpose of breaking established thought patterns and help create a good group atmosphere. For example, brainstorming rules, like *“defer judgment”*, *“encourage wild ideas”* and *“build on the ideas of others”* were used to encourage openness and trust. Five whys [34] was used to find the root cause of the problem and to reach a problem definition the whole group could agree on.

It was noted in several of the groups that one participant, often a more experienced one, took on the role of the "reality checker" or naysayer. As expressed by one of the facilitators *"as soon as somebody came up with an idea, he had an answer to whether it would work or not"*. Facilitation included discouraging comments of that kind in the idea generation phase.
The concept selection process included each group selecting their two strongest concepts, to present to the managers who would thereafter pick what concepts would get appointed resources for further development. Due to delays in the schedule the final selection process was done in a hastily manner, and there was not much time for discussion of the decisions. Several participants commented on this. For example one participant said *"(to) not be open for discussion and practically say "now, let's do like we decided", does not feel right"*.

4.3 Evaluation and lessons learned from the first workshop

A few days after the workshop was completed an evaluation questionnaire was sent to the participants. 15 out of 16 participants responded to the evaluation. The rating of workshop format and its work methods was 4.4, 3.6 and 4.0 respectively in the three groups. The groups rated the facilitators' performance 4.4, 3.8 and 4.4 respectively on a scale of one to five.
The aim with the workshop was to be able to progress to a stage where physical prototypes showing some functionality could be built. Some simple prototypes were built but not to the extent that was hoped for and more time for such activities was wished for in future workshops. This, together with the fact that a whole day committed to the same problem and with the same people was wearisome for both participants and facilitators, led to the next workshop being planned as a two day event. Furthermore, the evaluation showed that the decision making process was in need of redesign.

4.4 Planning and preparing the second workshop

On many aspects the second workshop was planned as the first workshop, however some changes were made to incorporate lessons learned from the first workshop and to adapt the workshop format to the new conditions. The second workshop comprised about as much time as the first one, but was conducted over two half-days instead of one full day (Table 2). Furthermore, the workshop was held in a company building some kilometer away from the R&D buildings, in order for people not to feel tempted to go back to their desks or attend meetings during the day. Nevertheless, one key person was called in to attend a meeting for about two hours, which had a notable impact on how the workshop proceeded as several discussions ended with "*we can ask N.N. when he comes back*".
Two users were invited to join in the background and problem definition discussion and thus had a more interactive role than the users who participated in the first workshop, an element appreciated by several of the participants. But they also raised concerns about this dual-sourced input being held as too universal; "*there is a risk that you hold their opinion as true for everyone who uses our products"*.

4.5 Execution of the second workshop

The aim of the second workshop was to come up with ideas for the next generation of a subsystem, with new functionality, including both hardware and software. One group and one problem was the center of the second workshop. Two persons facilitated the CPS process, one keeping full focus on the process and the other concentrating on practical aspects.

Table 2. Schedule for the second workshop occasion.

Start	Task
Day 1	
8.30	Introduction to the workshop and the problem
9.30	Background review and problem definition
10.15	Break
10.30	Brainstorm and creation of idea overview
12.00	Lunch
Day 2	
13.00	Reflection of day one and its process
13.30	Presentation of material
14.00	Evaluation of ideas
14.45	Break

15.00	Evaluations of concepts on a system level
15.30	Conclusion of the result
16.30	Reflection of the day

As a consequence of the feedback from the first workshop, the selection process of the second workshop was redesigned to be more transparent, flexible, and including the participants to a further extent. It was decided as the workshop progressed, in agreement with the participants and problem owner, to only create some rough concepts and a cross-disciplinary analysis that would serve as a basis for later development. The workshop did, in other words, generate a number of concepts but never reached the critical point of concept selection as initially was planned. Testimonies like "*to come up with complete solution when all departments were not represented did not feel realistic. So settling with this schematic result felt much better*", show that this change was positively received.

4.6 Evaluation and lessons learned from the second workshop

An evaluation similar, but not identical, to that of the first workshop was sent out and six out of seven responded. The rating of workshop format and its work methods was 3.7. The groups rated the facilitators' performance 4.3 on a scale of one to five. Many comments on the workshop highlighted the fact that designing software systems differs from designing hardware systems.

The evaluation revealed that the participants had not been given clear enough instructions to set aside time for working with workshop related tasks in between the two days. For future workshops such time should be properly assigned on beforehand.

5 ANALYSIS AND DISCUSSION

This part of the paper is devoted to an analysis and discussion of the empirical observations presented above, coupled with an exploration of what implications for facilitation the lessons learned in this study may have. The discussion is focused around three areas that we found insufficiently described in the literature; facilitation as a process rather than a single event, the importance of not only generating but also committing to workshop results, and the balance act of laughter as a means or goal in CPS.

5.1 Facilitation as a process

Facilitation does not begin when the group is gathered and the actual workshop takes place, nor does it end when people return to their respective departments. Like McFadzean and Nelson [25] we argue that facilitation starts with the planning of the workshop and the communication with the problem owner, and ends when there is a plan for how the workshop result is to be integrated in the normal product development process of the company. A workshop should always be adapted to the conditions of the particular problem at hand and therefore the planning phase is of utmost importance. Aiming at a workshop outcome where chances of an innovative product is key, should always be the thing that guides facilitation, not a strict process or managers' wishes for a quick solution.

5.2 Ensuring commitment

In a workshop context it is important that the group feels ownership of the problem they address, the ideas they come up with and the decisions that are made. Facilitation should never be about delivering clear-cut solutions, but guiding the participants to develop solutions themselves.

To create commitment to the workshop and the problem at hand we saw that it is important to reach goal clarity together with the group. A preliminary agreement of the problem definition, aim and delimitations should be made with the problem owner prior to the workshop, but for the participants to feel ownership of the problem, and to share a common understanding of the root cause and core difficulties they need to reach the final problem definition themselves.

Splitting the workshop in two also had positive consequences for the commitment by the participants. It enabled them to be prepared for and embrace the workshop outcome and its possible consequences for projects and participants' workload in the future before any decisions were made. There are also ideas that need to be worked through thoroughly, and there is not, and should not be, time for that at a CPS workshop. The break in the middle of the second workshop gave those ideas a chance to be properly considered before a decision was made. Failing to accomplish that may mean participants hang on to the ideas that were poorly addressed and refrain from the ideas that did get attention in the workshop.

As in the first workshop in our study, participants who experience that they are not invited in the decision making process may fail to commit to the workshop decision. Quickly made decisions may cause effects that render the quick process fruitless, since decisions have to be revisited long after the workshop is over to convince people about the value in the concepts selected. In the planning phase it is important to clearly state for the problem owner that reaching a well-founded high quality decision is difficult and may even prove impossible within the frame of the workshop.

5.3 Why laughter is welcome but not necessary

An atmosphere where everyone dares to put forward ideas and where jokes and laughter is positively regarded is beneficial for creativity [28]. Facilitation thus includes stopping behavior that may have a negative effect on such elements of the workshop atmosphere. Observing these workshops it was noted that there is often one participant, often a participant with extensive knowledge in the field, who takes on the role of a naysayer, and consequently do not participate in the idea generation process, or encourage that of others. If not stopped, it is easy to get caught in a vicious circle where people's fear of rejection of their ideas and opinions is constantly confirmed and enforced. But, facilitation should never have the main purpose of creating a good environment with lots of laughter. That atmosphere is merely one means to elicit creative behavior and not the goal of the workshop.

Thinking creatively is often a taxing process, which may be difficult, slow, and uncomfortable. In this study, examples were seen of how easy it is to fall back into patterns where the facilitator strives to create an atmosphere where people "enjoy themselves, have fun and act crazy". Like deBono did already back in 1988 [35], we would like to raise a warning against mistaking a fun CPS workshop for a good one. Judging by people's perceptions about brainstorming and CPS, this is still a valid remark. It is an important quality of a facilitator to be able to motivate a group to keep going on the chosen track even when the atmosphere is strained and quiet, and to not feel forced to cheer people up.

So why is this? According to Badke-Schuab [4] *"creative behavior is not the predominant thinking style of human beings; there must be a challenge which forces creativity"* (p.359) and facilitation includes providing such challenges. Challenges that will be counterintuitive and push the participants out of their usual thinking patterns. From our experience we saw that taking on such challenges can be both difficult and frustrating.

The everyday operative work of an engineer is often analytical or rational, a way of working where people can use their natural or learned ways of thinking. Shifting to a more creative way of working may require some assistance, and that is where facilitation can play an important part. Sometimes facilitating, by challenging the participants to come up with wild, 'out of the box' ideas, has the mere purpose of downplaying the participants' analytical behavior. Studying these workshops it was seen that when participants knew it was only a challenge which lasted for a limited amount of time, it was in some cases easier for them to contribute and set aside their need for analyzing an idea's feasibility.

The workshops described in this study aimed at innovation, rather than just creative ideas. Facilitation thereby, did not merely include inspiring the groups to come up with new ideas, but also ideas that take into account trade-offs between for example novelty, cost, user needs, and manufacturability. In our experience engineers easily fall back on what is technically possible, even though they are aware of the above mentioned demands. Facilitation includes keeping track of such demands and guiding the group in the trade-off analysis.

Facilitating CPS workshops thus will include putting the participants in situations where they have to step out of their usual ways of thinking and counteracting their usual behavior. This inevitably is a challenge to the participants and often leads to moments of silence, concentrated thinking and frustration. Therefore, when facilitating, one should not expect, or aim, at laughter and a constant cheerful atmosphere, but simply make sure such behavior is welcome.

6 CONCLUSIONS

Analyzing the workshops of this study, it is clear that for some people, facilitated workshops do serve an important purpose. Proficiency among engineers in structurally tackling problem solving with the help of creativity tools is uncommon, and being aided in that process was positively regarded by many of the participants in the workshops in this study.

We would like to contribute with some aspects of facilitation that are sparsely addressed in the literature and that have interesting implications for practice. Firstly, we would like to underline that facilitation is a process and not a single event where the facilitator arrives at the workshop unprepared.

Substantial preparatory work is necessary to increase the chances of a successful workshop. Secondly, there is a need to evaluate a workshop not only by the result it generates, but also by how those results are incorporated in the organization. Committing to the workshop and its results is essential if the workshop is to leave long-lasting effects. Finally, we would like to raise a warning against regarding fun workshops as successful ones, based only on the workshop atmosphere. Being creative is a process that is often counterintuitive and may well lead to difficult and frustrating moments. A workshop can be serious and frustrating and still be successful, and it is an important aspect of facilitation to be at ease with such situations.

When planning and carrying out these workshops, but also in the process of writing this paper, a number of interesting areas for further research have emerged. For instance, what effect would a more extensive involvement of users have on the level of creativity, commitment to the results and group dynamics? Another interesting topic would be whether having to evaluate and select the best ideas also has an impact on the level of creativity in the antecedent phases.

REFERENCES

[1] Clark, K. and Fujimoto, T., *Product development performance: Strategy, organization, and management in the world auto industry*. (Harvard Business Press, 1991).

[2] Drucker, P.F., The discipline of innovation. *Harvard Business Review*, 2002, 80(8), pp95-102.

[3] Amabile, T.M., Conti, R., Coon, H., Lazenby, J. and Herron, M., Assessing the work environment for creativity. *Academy of Management Journal*, 1996, 39(5), pp1154-1184.

[4] Badke-Schaub, P., Creativity and innovation in industrial design: wishful thinking? *Journal of Design Research*, 2007, 5(3), pp353-367.

[5] Amabile, T., Keep doing what you're doing. Or, if you want to spark innovation, rethink how you motivate, reward, and assign work to people. *Harvard Business Review*, 1998, 76(5), pp77-87.

[6] De Bono, E., *Lateral thinking: creativity step by step*. (Harper & Row, New York, 1970).

[7] McLean, L.D., Organizational Culture's Influence on Creativity and Innovation: A Review of the Literature and Implications for Human Resource Development. *Advances in Developing Human Resources*, 2005, 7(2), pp226-246.

[8] Amabile, T. and Kramer, S., Inner work life. *Harvard Business Review*, 2007, 85(5), pp72–83.

[9] Isaksen, S. and Treffinger, D., Celebrating 50 years of reflective practice: Versions of creative problem solving. *The Journal of Creative Behavior*, 2004, 38(2), pp75-101.

[10] Adamsson, N., Interdisciplinary integration in complex product development. Thesis (PhD). Department of Machine Design, KTH 2007

[11] Geschka, H., Creativity Techniques in Germany. *Creativity and Innovation Management*, 1996, 5(2), pp87-92.

[12] Paulus, P., Groups, Teams, and Creativity: The Creative Potential of Idea generating Groups. *Applied Psychology*, 2000, 49(2), pp237-262.

[13] Dym, C., Agogino, A., Eris, O., Frey, D. and Leifer, L., Engineering design thinking, teaching, and learning. *IEEE Engineering Management Review*, 2006, 34(1), pp65-92.

[14] Ulwick, A., *What customers want*. (McGraw-Hill, New York, 2005).

[15] Ulrich, K.T. and Eppinger, S.D., *Product Design and Development*. (McGraw-Hill/Irwin, New York, 2008).

[16] Osborn, A.F., *Applied imagination*. (Scribners, New York, 1963).

[17] Isaksen, S., Puccio, G. and Treffinger, D., An ecological approach to creativity research: Profiling for creative problem solving. *Journal of Creative Behavior*, 1993, 27, pp149-149.

[18] Goldenberg, J., Horowitz, R., Levav, A. and Mazursky, D., Finding your innovation sweet spot. *Harvard Business Review*, 2003, 81(3), pp120–130.

[19] Jöstingmeier, B., *Cross-cultural innovation: new thoughts, empirical research, practical reports*. (Oldenbourg Wissenschaftsverlag, München, 2007).

[20] Sanders, E. and Stappers, P., Co-creation and the new landscapes of design. *CoDesign*, 2008, 4(1), pp5-18.

[21] VanGundy, A.B., *Idea power: Techniques & resources to unleash the creativity in your organization*. (American Management Association, New York, 1992).

[22] Nelson, T. and McFadzean, E., Facilitating problem-solving groups: facilitator competences. *Leadership & Organization Development Journal*, 1998, 19(2), pp72-82.

[23] Sanders, E.B.N., Design research in 2006. *Design research quarterly*, 2006, 1(1), pp1-8.
[24] Lee, Y., Design participation tactics: the challenges and new roles for designers in the co-design process. *CoDesign*, 2008, 4(1), pp31-50.
[25] McFadzean, E. and Nelson, T., Facilitating problem-solving groups: a conceptual model. *Leadership & Organization Development Journal*, 1998, 19(1), pp6-13.
[26] Brandt, E., Event-driven product development: collaboration and learning. *Technical University of Denmark*, 2001.
[27] Offner, A.K., Kramer, T.J. and Winter, J.P., The effects of facilitation, recording, and pauses on group brainstorming. *Small Group Research*, 1996, 27(2), pp283.
[28] Ekvall, G., Organizational climate for creativity and innovation. *European Journal of Work and Organizational Psychology*, 1996, 5(1), pp105 - 123.
[29] Anderson, N.R. and West, M.A., Measuring climate for work group innovation: development and validation of the team climate inventory. *Journal of Organizational Behavior*, 1998, 19(3), pp235-258.
[30] Sanders, E.B.-N. and Stappers, P.J., Co-creation and the new landscapes of design. *CoDesign: International Journal of CoCreation in Design and the Arts*, 2008, 4(1), pp5 - 18.
[31] Lund, K., The Sister Kenny Research Center Innovation Handbook. pp80 (The Sister Kenny Research Center, 2009).
[32] Coughlan, P. and Coghlan, D., Action research for operations management. *International Journal of Operations & Production Management*, 2002, 22(2), pp220-240.
[33] Brannick, T. and Coghlan, D., In defense of being "native": the case for insider academic research. *Organizational Research Methods*, 2007, 10(1), pp59.
[34] Ohno, T., *Toyota production system: beyond large-scale production*. (Productivity Press, New York, 1988).
[35] De Bono, E., Serious creativity. *Journal for Quality and Participation*, 1995, pp12-12.

Contact: Katarina Lund
KTH Royal Institute of Technology
IPD, School of Industrial Engineering and Management
Brinellvägen 85
100 44 Stockholm, Sweden
Phone: +468-553 89160
Email: kalund@kth.se

Katarina is an Industrial PhD student employed at Scania and affiliated with the department of Integrated Product Development, KTH in Stockholm. Her research field is within work methods for creativity in efficient R&D organizations.
Johan has a PhD degree in Machine Design and has had a position within Scania to deploy lean, efficient and innovative methods in the R&D organization. Presently he holds a position as a project manager at Power train Control system.