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Learning facilitating leadership

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LEARNING FACILITATING LEADERSHIP

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Abstract

This paper explains how engineering students at a Danish university acquired the necessary skills to become emergent facilitators of organisational development. The implications of this approach for improving the skills of emergent leaders are discussed and related to relevant viewpoints and findings in the literature. The methodology deployed for this paper is empirical and conceptual. A specific facilitation project carried out by six international engineering students is presented. The importance of combining cognitive, emotional and synergistic skills is highlighted on the basis of this example, the authors' extensive experience in teaching facilitation and the literature. These types of skills are most effectively acquired by combining conceptual lectures, classroom exercises and the facilitation of groups in a real-life context. The paper also reflects certain 'shadow sides' related to facilitation observed by the students and discussed in the literature. The educational process description and reflections presented in this paper can help university staff and mentors in public and private organisations to adopt interactive methods for education and training. A brief overview of the methods used is included in the Appendix. By connecting the literature, the authors' and engineering students' reflections on facilitator skills, this paper adds value to existing academic and practical discussions on learning facilitating leadership.

Keywords – *facilitation skills, distributed leadership, interactive methods, communication techniques; ways of knowing, conceptual and practice-based learning.*

Introduction

The increasing interconnection of communication technologies and new forms of interaction are creating new opportunities and challenges for engineers. Today's engineering students can expect to be exposed to a rising number of organisations engaging in contractual joint ventures, alliances and other forms of inter-organisational relationships. In addition, virtual cooperation, mediated by interconnected and diversified systems, is growing in popularity (Schweitzer, J., 2014; Jensen, K., 2011). Companies are forced to shape structures and procedures that support leadership for creative learning and convergent actions taking these new forms of interaction into consideration (Schweitzer, 2014; Kaner, 2007). They imply new demands on skills and methods.

Therefore, technical universities need to renew and update their courses and education programmes in order to help engineering students develop into professionals able to meet the changing technical and organisational conditions (Crawley et al., 2014). It has become essential that engineering students learn interactive methods and interpersonal skills alongside their technical knowledge (Spiess et al., 2015; Johnston, 2012; Anderson and Anderson, 2010). Given the pervasiveness of these challenges, the key questions addressed by this paper are: How can technical universities develop engineering students into skilled professional facilitators? What kinds of skills should they acquire, and how? Why are these facilitative skills especially relevant in organisations with distributed leadership? (Bussey, 2014; Raelin, 2012; Jameson, 2009). The paper is based on the authors' more than ten years' experience conducting teaching about facilitation for Danish and international engineering students at the Technical University of Denmark illustrated by an example and supported by literature.

Facilitating and distributed leadership

Literature that focuses on organisational learning encourages leaders to move away from the command-and-control paradigm, and toward that of a more distributed leadership – taking on the sharing of responsibilities and support for continuous learning processes of their staff (Jönsson and Schölin, 2013; Raelin, 2012; Rasmussen a, 2011; Hartley, 2007).). Facilitating and distributed leadership are closely related. As pointed out by Jameson:

"Positional leaders who are capable of sharing some powers encompassed within their role to delegate discretionary authority to others could be described as facilitators of a 'distribution' of leadership tasks." (Jameson, 2009:226)

As facilitators of the distribution of tasks, such leaders must be able to create environments for dialogue and discussion. They should often ask, not tell, group members exactly what they need to be doing (Egan, 2010). They are keen to help the group members bring to the surface not yet fully expressed thoughts and feelings, and also issues the members may be unaware of or unwilling to address in their daily routines (Gray and Williams, 2014; Railin, 2012). Facilitating leadership is not just about immediate tasks or special problem solutions. It is also about supporting and engaging group members to help each other be more effective, and laying a foundation for future improvements of creative and constructive group dynamics (Hartman et.al., 2015; Winter et. al. 2006). Distributed leadership presupposes the creation of a collegial culture in which the members' individual opinions, experiences and ideas are seriously acknowledged, solicited and discussed (Woods et.al. 2004; Denison et.al., 1995). It does not mean that this type of leader abdicates their overall leadership responsibilities to the group. They should always be able to manifest their authority when they believe it is necessary to do so. Facilitating leaders believe that to realise the full potential of the group, every member must be convinced that s(he) is a necessary participant in a greater purpose (Kellett et.al. 2002). It is fundamental for them that responsibilities are distributed in such a way that they allow each group member to share 'ownership' of the problem statement and/or problem solution by active participation in the dialogue and discussion process (Raelin, 2012; Egan, 2010; Alexander and Maiden, 2004; Gronn and Hamilton, 2004; Gronn, 2002;). Therefore, they will be keen to help the group members make connections between what they are discussing now and what they discussed previously or are expected to handle in the future. This effort is especially relevant in fast-paced organisational environments frequently overloaded with a multitude of more or less important information (Hedman and Valo, 2015). Facilitating leadership is not necessarily in contrast to rational management. Rather, it is a form of leadership that combines cognitive and emotional skills – meaning that thinking and feeling should be congruent rather than separated from or in opposition to each other. Increasingly, engineers as leaders find

themselves in situations where the use of facilitating skills is not simply an option, but a necessity (Magaryan et al., 2013; Barnes, B. et al., 2013; Agostino et al., 2013; Lund and Tingström, 2011; Adams and Means, 2006). For engineers to function effectively in inter-disciplinary teams, it is insufficient to only be technically knowledgeable. They must also be able to communicate with team members who have different professional languages during the co-creative process in an authentic context (Hallenga-Brink and Vervooit, 2015. These challenges call for recognition of the idea that education is far more than learning facts about specific disciplines while sitting in a classroom (Krause, 2015; Crawley et al., 2014; Caulfield and Woods, 2013; Raelin, 2012; Spencer et al., 2011; Lam, 2011; Castells, 2000).

The next sections of this paper will describe and discuss how a group of international engineering students learned to facilitate a workshop in a real-life context, including how they were able to combine their concrete experiences with theory-based reflections on what they learned.

Course frame, structure and content

Over the past decade, the authors have been responsible for planning and conducting a course at the Technical University of Denmark about facilitating skills. This course is part of a *Master of Science and Engineering Management Programme* for Danish and international engineering students. The students are told that generally, facilitation has *three basic goals*: 1) to help the client manage a specific problem situation more effectively in the future; 2) to help the client become better at helping themselves in the future; and 3) to help the client develop an action-oriented prevention strategy for avoiding a similar problem situation arising in the future.

A range of facilitator education approaches exist within the literature. Most of the approaches fit within one or several of the following frameworks suggested by Glyn Thomas (2008):

- *Technical facilitator educations* focus on the skills and competencies required to facilitate groups and organisations. The assumption is that a student can learn to facilitate a group's process by gaining knowledge of a certain set of skills and methods.
- *Intentional facilitator educations* also include the skills and competencies to facilitate, but add that the emergent student facilitators need to be deliberate in their actions and have the ability to explain the reasoning behind those actions using appropriate theories.
- *Person-centred facilitator educations* focus on the personal qualities of the emergent facilitator as well as the interactive relationship between the facilitator and the facilitated group.
- *Critical facilitator educations* raise awareness of the political and ethical aspects of facilitation. According to these approaches, facilitators need to have a political and ethical awareness of the facilitation roles they should act out in an organisational context.

The four frameworks are not necessarily mutually exclusive, although the literature provides examples of disagreements among the technical and critical approaches (Thomas, 2008).

The course featured in the example in this paper incorporates all four approaches. First, the engineering students learn various facilitation methods and techniques. Second, they are introduced to relevant concepts and theories. Third, they learn to be aware of their personal attitudes, as well as how to create a relationship with the workshop participants building on trust, openness, active listening and appropriate interventions. Fourth, the course enables discussion about the different forms of covert and non-ethical manipulation possibilities related to the facilitator role. The language of instruction is English and the language used by the students in international groups or in mixed Danish /international groups is English, while groups with Danish students only speak Danish to each other, but English when they are participating in a discussion going on in the classroom involving different groups.

The course is divided into five phases:

Phase 1: Introduction of theory of organisational management and learning. For instance, what are the essential characteristics of the different organisational management paradigms? Which different levels of problem complexity is it possible to distinguish between? Concepts and models on group dynamics, learning, ways of knowing, ethical aspects of facilitation, and concepts of creativity and facilitation are introduced to the engineering students, too. In addition, exercises using facilitation and workshop techniques such as association techniques, negative brainstorming, summary techniques, techniques to introduce 'ice-breakers', techniques to cope with dysfunctional behaviour, techniques to facilitate action plan creation, techniques of workshop planning, workshop conduction and workshop evaluation are also presented, carried out and discussed in this phase.

Phase 2: Presentation of interactive methods. Interactive methods are defined as methods that actively involve stakeholders in problem-defining and problem-solving activities. The course teaches students how to facilitate processes using interactive methods like future workshops, search conferences, design games, causal mapping, dialogues, scenario planning, interactive SWOT analyses, interactive planning, and improvisational theatre. (Each of these methods is briefly described in the Appendix). These interactive methods are presented by teachers and guest speakers, who illustrate application of the methods with practical examples. As emergent facilitators, the engineering students must become aware that there is no single omnipotent, interactive method (Nikolova, 2014). Therefore, they are asked to draw on a mixture of styles, skills and communicative techniques, and tailor them to the kind of relationship that is most appropriate for the particular client they have agreed to cooperate with. They learn that facilitators must be able to plan appropriate workshop phases, guide the participants to achieve creative and useful outcomes, and sustain a participatory environment (Lund and Tingström, 2011; Rasmussen c, 2011; Rush, 2007; Hodgson and Zaiman, 2003).

Phase 3: A practical workshop exercise in the classroom. A group of student volunteers facilitate the rest of the class in applying two of the interactive methods presented in phase 2. Thus, the engineering students learn that application of interactive methods is like using 'mental laboratories', within which various ideas and development activities can be tested before deciding whether they should be implemented within the organisation or not (Garibaldo and Rasmussen, 2011). Interactive methods can provide users with the power to challenge established stereotypes and compel them to question their assumptions and usual habits (Müllert, 2011; Limborg and Hvenegaard, 2011; Mehra, 2011). During this exercise, the engineering students experience how creative facilitation is able to break outdated ways of seeing, thinking, communicating, being and/or doing, and thereby enable participants or members to act innovatively and in accordance with prevailing challenges.

Phase 4: The student groups agree with a client to facilitate a workshop regarding a problem situation described and negotiated with the client. Such a problem situation is often poorly defined, or if it is believed by the client to be well defined, it is often the case that the client still doesn't know how to adequately handle it. The student facilitators must negotiate with this client regarding how the problem situation could be more precisely defined and understood, as well as how a workshop could be conducted in a practical setting within part of the client's organisation. In such a "working alliance" (Egan, 2010), both parties have *responsibilities* and work to do, and the quality of the outcome depends on how they interact together. In some of the exercises in the first part of the course, the student facilitators refine their abilities to handle different types of clients. As

described in more detail in an example below, the engineering students then facilitate a workshop for selected organisational participants (workshops usually run for between 3 and 7 hours).

Phase 5: The students describe, analyse and reflect on the facilitation process using their knowledge about relevant concepts, theories, methods and techniques introduced in phases 1 and 2 of the course. They deliver a joint report about what they have learned. This report is evaluated by the teachers and an external examiner who assess whether the student facilitators have fulfilled the learning objectives of the course. We describe and reflect on the quality criteria used later in this paper.

The structure of this course does not strictly follow the paradigm of *Problem-Based Learning* (PBL) (Chan, 2016; De Graaff, 2016; Edström and Kolmos, 2014; Illeris, 2007; Boud and Feletti, 1997; Sobral, 1995). In contrast to PBL, "*problems*" are *not* seen as the "…*starting point for the learning processes*" (Edström and Kolmos, 2014:544). The learning process in our course starts with lectures and exercises in the classroom (phases 1 and 2). This is because we believe that the Danish and international engineering students should learn the theoretical framework and interactive methods before they are able to define an appropriate workshop context together with a client organisation. However, phases 3, 4 and 5 in our course share many similarities with PBL, including defining the problem together with a 'client', and interdisciplinary theory-practice relations between sociology, social-psychology, and engineering concepts and methods (Kolmos and De Graaff, 2013; Neville and Norman, 2007; Savin-Baden, 2003; Kolmos, 1996). The social approach of our course is also similar to PBL. In all course phases, the learning takes place in teams. In the phases 3 and 4 the Danish and international engineering students are becoming more and more aware of how to organise a workshop together with a client organisation. A special feature of our course is that we don't expect the engineering students to define a problem or propose specific problem solutions, but to facilitate the client organisation to do so.

The course also shares similar intentions with another well-known education programme for engineering students, namely the *CDIO* (*Conceive-Design-Implement-Operate*) *approach* (Crawley et al., 2014; Edström and Kolmos, 2014; Bennedsen et.al. 2014; Cloutier et.al.; Gregersen, et.al. 2009; Malmquist, 2009; Crawley et.al. 2007).). First, similarly to CDIO it combines theory and experiential learning. Second, like CDIO it also takes an interdisciplinary perspective. However, our course does differ from CDIO regarding the learning of facilitation skills. CDIO is a cognitive approach (Crawley et al., 2014), while our course includes a combination of cognitive and emotional skills – as will be explained later in this paper.

Learning facilitation in practice: An example

The following example describes how a group of six engineering students learned facilitative skills during the fall of 2012. The six students came from very different countries and cultures (Canada, Germany, France, Spain, South Korea and Pakistan). They had never been introduced to facilitation concepts before they attended our course. By describing what they did and learned in detail, the intention is to exemplify how it is possible to combine conceptual and practice-based learning of facilitation also when the students are from different countries and are asked to facilitate a workshop together in a real context.

After having passed through phases 1, 2 and 3 of the course, the six international engineering students started by contacting organisations that might be suitable and willing to participate in a workshop. One responded positively – namely a large, multi-national corporation with several companies placed in Denmark (from here onwards referred to as 'the client'). The preparation phase

started with two introductory meetings between the students and a contact person from the client in order to fulfill the following tasks:

- Define an overall topic for the workshop (suggested by the client)
- Fact-finding about the selected topic
- Discussion of and final agreement on the interactive methods to be used in the workshop (suggested by the students based on their knowledge from the course)
- Elaboration of a list of workshop participants to be invited (suggested by the client and the students)
- Assessment of suitable and available physical and technical facilities offered by the client
- Planning of follow-up processes after the workshop

During the first meeting, the client contact showed the students a process flow chart describing the area in which the client experienced a problem or, rather, a problem situation. The six student facilitators received detailed information about the stakeholders' set-ups, their roles and responsibilities, as well as the approximate time frame for the different process steps. In addition, they were told that the client had carried out a 'Kaizen Workshop' on exactly the same topic some time ago. However, no proper action plan was identified during that previous workshop, and as a result the drafted solutions were never implemented. To prevent this from reoccurring, emphasis on an action plan and distinguished responsibilities according to the implementation were given high priority within the student facilitators' workshop planning. Based on these two preliminary meetings, the client and the student facilitators agreed on the following problem statement for the planned workshop: *How can we reduce the amount of time in the molding tool approval/acquiring process?*

During the meetings and associated interviews with other employees of the company, a number of problems were identified by the student facilitators. These included communication gaps between the various departments and delays in documentation. During an iterative dialogue involving the client and the teacher, the students discussed and reflected on the benefits and weaknesses of all interactive methods presented in the course. The final choice of method was *The Future Workshop* (Müllert, 2011) combined with selected aspects of *The Design Game Method* (Brandt, 2011), *The Interactive Planning Method* (Hansen and Rasmussen, 2011), and *The Interactive Scenario Analysis* (Rasmussen b, 2011). Those methods are described briefly in the appendix.

The time schedule for the workshop, as agreed between the student facilitators and the client, is shown in figure 1.

Figure 1: Time schedule for the workshop (Ali et al., 2012)

Time	Action	Notes	Resources
8:00	Arrive at company		
8:00-8:15	Prepare for meeting with client contact		
8:15-8:30	Meet with client contact		
8:30-9:00	Organise workshop room and prepare for workshop		
9:00:9:05	Description of day, goals of workshop etc.		
9:05-9:20	Ice-breaker 1	Fun Fact Game	- 30 Cue Cards - Markers
9:20-10:50	Future Workshop Critique Phase: a) introduction; b) split the participants into groups; c) brainstorming; d) clustering; e) select statements to continue with for the next phase		Slides, pens, sheets, post-its
10:50-11:00	Break		
11:00-11:10	Ice-breaker 2	Animal Game	
11:10-12:00	Future Workshop Fantasy Phase (1): a) changing negative statements into positive ideas b) begin clustering of ideas		Slides, pens, sheets, post-its
12:00-1:00	Lunch		
1:00-1:50	Interactive Planning-End Planning (2): a) finish clustering of ideas b) select ideas to continue with in the next phase		Slides, pens, sheets, post-its
1:50-2:00	Break		
2:00-2:10	Ice-breaker 3	Team Drawing	Slides, pens, sheets, post-its
2:10-4:00	Implementation a) presentation of phase b) presentation of selected ideas c) split into subgroups d) each group pools their demands e) discussion to agree on the most relevant demands f) each group prepares an action plan		Slides, pens, sheets, post-its
4:00-4:30	Presentations		Slides, pens, sheets, post-its
4:30-4:45	Debrief with client contact		

After having divided the eight Danish workshop participants from different departments of the company into two subgroups, one of the student facilitators explained the workshop goals and planned activities. Thereafter, he led participants in the first ice-breaker (see figure 1). Exactly as intended, this event created a more relaxed atmosphere among the participants. Another of the student facilitators then briefly explained the idea behind and process for the critique phase (see figure 1). By using a creativity-promoting association technique, which the student facilitators learned in the first part of the course, each of the two subgroups formulated 15 critical statements related to the overall problem statement: *How can we reduce the amount of time in the molding tool approval/acquiring process?*

The participants tried jumping right into listing potential solutions, but were reminded by the facilitators several times to only write down identified problems in order not to circumvent the following fantasy phase. The participants analysed the problem statement and shared their reflections on the causes. The outcome of this phase was presented in a number of problem statements that the participants could work further with in the following phases of the workshop in order to generate ideas on how to solve the problem. After this phase was completed, a third member of the student facilitators initiated the second ice-breaker, the 'Animal Game'. Each participant was asked to imitate a chosen animal and the other members had to guess which animal (s)he was trying to imitate. In the planning phase, the client's contact person had expressed scepticism about this ice breaker because he feared that it would be too intimidating for the participants. However, the student facilitators managed to convince him that this activity would be necessary to create a relaxed attitude among the participants. In practice, the game was fun and entertaining for participants – and involved considerable laughter. As intended, it induced a relaxed atmosphere among the participants, preparing them for a creative process in the following fantasy phase (see figure 1). In this phase, two of the student facilitators guided each subgroup changing the negative statements into potential solution ideas. Then they clustered these ideas in a grid according to two parameters: 1) time taken to implement, and 2) possible impacts of implementation of the idea. After a lunch break, the second part of the fantasy phase was conducted. The solution ideas placed in the grid were ranked and each subgroup was then asked to select two of the ranked ideas to work on in the implementation phase (see figure 1). In this phase, the student facilitators were guiding each subgroup to discuss and then agree on at least three demands to capture their solution ideas. Then, each subgroup presented their suggestions to the others and each suggestion was scrutinised and supplemented with additional demands by the other group. Finally, each subgroup produced a concrete action plan facilitated by the engineering students, and including goals for improvements, timelines and distributed responsibilities. The following week, the workshop participants presented their plans to their superiors, who recognised and accepted their suggestions for change. They agreed to meet during the following weeks in order to support and take an active part of the realisation of the agreed changes.

Responses from the workshop participants

The workshop participants were asked to provide an anonymous assessment of the course with a short questionnaire handed out during the last phase of the workshop. They were asked to assess how well the engineering students had behaved as facilitators, the degree of usefulness of the different phases of the workshop – including the ice-breakers – and comment on which aspects had been especially good versus those which were less successful.

In general, they responded very positively. They unanimously agreed that the student facilitators were good at explaining the different phases. They also appreciated the so-called 'ice-breakers'.

Examples of participants' comments were: "*…good atmosphere …the ice-breaking sessions went well...we achieved two good action plans....ready to do it again... I did not see you as students"* (Ali et al., 2012, app. A, p.11). There were no teachers observing the workshop process, because it could potentially have been a disturbing factor. However, one of the teachers spoke by telephone with the contact person afterwards and he confirmed that the student facilitators had been successful in guiding the participants towards achieving very useful solutions to their problems. In addition, one of the teachers also spoke with two of the participants who also confirmed the statements made in their written assessments. All in all, the workshop was successful from the participants' viewpoints, because they learned new interactive methods and achieved "two good action plans". The student facilitators learned to practise facilitative skills and, later in their report, to reflect their practical learning in the theoretical framework introduced to the engineering students during phase 1 of the course (Rasmussen a, b, and c, 2011).

Ways of knowing and learning

In the first part of the course, all of the engineering students are introduced to epistemology concerning the nature of knowledge that can be obtained and developed (Rasmussen a, 2011; Heron, 2000; Argyris and Schön, 1996).). The conception of 'knowledge' in facilitating organisational development, they are told, implies a special dialectics between subjective and objective perspectives on knowledge creation (Fuller and Loogma, 2009; Boisot, M., 1998; Dewey, J. 1922) According to the social construction paradigm applied in the course, knowledge about the future is neither absolutely subjective nor objective in nature, but rather a dialectical interaction between subjective and objective aspects (Putham, H., 2002; Guba and Lincoln, 1994). It is subjective because the future can only be known through the form the mind gives to it. But it is also objective, because human beings use their imaginings about the future to shape a given state of its material and mental existence from one state to another state of reality (Stratigea and Katsoni, 2015; Rhisiart, 2013; Calof et al., 2012).

Human beings create knowledge and action interdependently through their participation in communicative, imaginational, conceptual and/or practical constructs (Thomas and Hirschfeld, 2015; Rasmussen a, 2011; Fuller and Loogma, 2009; Heijden, 2004/1996; Heron, 2000). Therefore, the emergent student facilitators need to be able to understand and draw on different ways of knowing:

- *Doing (Techne)* is knowledge of how to do something in practice – for instance, how to plan a workshop. Fundamentally, skills in this area involve learning methods and techniques to fix a certain object or to guide other people.
- *Understanding (Scientia)* is intellectual and scientific beliefs and theories that contribute to codifying and explaining a certain phenomenon or action – for example, why some participants in a workshop react negatively and others positively when the facilitator suggests a particular way of continuing the workshop.
- *Being (Praxis)* is knowledge gained from a practical situation – for instance, how the facilitator behaves in a critical phase of the workshop process.
- *Relating (Relatio)* is knowledge about how to communicate or treat other persons – for instance, how the facilitator communicates with workshop participants.
- *Seeing (Gnosis)* is knowledge achieved through using intuition and imagination – for instance, how workshop facilitators use their intuition and experience to react purposefully to a critical event during the workshop (Rasmussen b, 2011; Heron, 2000; Inayatullah and Wildman, 1996).

We employ these five ways of knowing in everyday life, sometimes tacitly and sometimes explicitly (Nafei, 2014; Rasmussen a, 2011; Ellström, 2010; Nonaka and Takeuchi, 1995; Lave and Wenger, 1991; Polanyi, 1966), depending on our personalities and the situation at hand. In general, it is assumed that our knowledge is more valid if the five ways of knowing are congruent with each other. This means that knowing is grounded in experience and intuition, expressed through images, figures and narratives, and understood through theories that make sense and are applied in practice by the means of appropriate methods and techniques (Rasmussen a, 2011; Heron, 2000).

Three core facilitation concepts

In the course, we distinguish between *three core facilitation concepts*, namely *cognitive reasoning, emotional empathy and collective resonance.*
Cognitive reasoning means being able to analyse a specific context, formulate clear and cohesive plans and select appropriate methods and communication techniques. In our course, it also includes theory-based reflections on the facilitation process after the workshop has been conducted (phase 5). Applying skills of cognitive reasoning are not specific for in our course, but are also more generally used in engineering education programmes as for instance CDIO and PBL (Crawley et. al. 2014 /2007; Edström and Kolmos, 2014; Bennedsen et.al. 2014; Gregersen, et.al. 2009; Searle, 1992).

Emotional empathy is the emotional ability to step outside of one's own feelings to take another person's emotional perspective in a certain situation (Kellett et.al.2002; Salovey and Mayer, 1990; Katz, 1963). Emotional empathy is a commitment to seeing the participant's behaviour in and within the emotional context of his/her position and role in the organisation. Second, it is also a commitment to perceive the possible dissonances between the participants within the context of their different emotions and values. A facilitator using the skill and commitment of *emotional empathy* is in a better position to handle dissonance between the participants, for instance. If the facilitator is able to intervene appropriately in such situations, it can release energy and may contribute to reaching a higher level of creativity and achieving useful outcomes. However, it can also become destructive if their emotions exceed the participants' boundaries and the facilitator is unable to mediate any tension or conflicts.
The term *synergy* comes from the Greek word "synergos" meaning "cooperative action". In order to foster synergy among workshop participants, the facilitator should be able to create *collective resonance,* defined as a felt sense of energy and rhythm that positively influences cooperative feeling, thinking and action in a group of people such that the total effect of their interaction is greater than the sum of the effects considered independently (Hertel, 2011; Wilson, 2009; Hamilton, 2004; Levi, 2003; Webster, 1996). For instance, when two waves rhythmically entrain in the natural world, they integrate as one wave to create an amplified effect. Similarly, when collective resonance occurs in project teamwork, the team members can tap into the underlying creative energy of the shared process (Levi, 2003). The ability to create synergy depends on how well the skills of cognitive reasoning and emotional empathy merge during the facilitation process. The resonant facilitator is characterised by an ability to bridge these two

skills in a way that is precisely aligned, attuned and adapted to the situation and stage of the project work (Pennington, 2011; Tassoul, 2011; Rasmussen c, 2011). Once the creative process is 'in flow', a moment arises when the facilitator must stand aside and allow the process to establish its own momentum. The skills involved in creating collective resonance include listening to the speed, pitch and tone of the participants' speech, or to the length of their laughter or silences (Hamilton, 2004; Levi, 2003; St. Anna, 1999). These skills also include noticing facial expressions or body language and sensing changes in energy levels within the group (St. Anne, 1999). If the student facilitators are able to correctly synthesise and interpret the different signals from the participants, they will also be better able to react to these signals and guide the process towards more synergistic behaviour.

In the following sections, we will describe how we subdivide cognitive reasoning, emotional empathy and synergistic resonance into more operational variables useful for the learning process and for the evaluation of the student facilitators' performance during our course.

Assessment criteria

The assessment criteria are developed by a team of university teachers at the Technical University of Denmark (DTU). They have also been discussed with and approved by external examiners who are evaluating the engineering student facilitators' reports. These external examiners are university teachers from other Danish universities. The course is part of a *Master of Science and Engineering Management Programme* for Danish and international engineering students and as such it's learning goals, contents and evaluation form are approved by the Study Programme Board at DTU.

Cognitive facilitator skills

The teachers and the external examiner look for documentation evidencing how well the engineering students have learned the following cognitive facilitator skills:

- *Planning of the workshop facilitation process.* One of the most important pre-conditions for a successful workshop is detailed planning of the workshop facilitation process. The engineering student facilitators are asked to describe how their choice of methods has been adjusted to the client's formulated problem and its complexity, the number and types of workshop participants, and the scheduled workshop duration.

- *Communication with the workshop participants during the planning stage.* The engineering student facilitators should also be able to describe how and what they communicated with the client's contact person and with the workshop participants regarding the agenda, roles and rules for the workshop before it started. Such an interactive planning process helps them to develop their analytical reasoning, including a discussion of the potential impact of their planned use of interactive methods. They also learn the importance of a careful investigation of the client's problem understanding before they start the facilitation process.

- *Guidance in problem formulation.* The engineering student facilitators are asked to describe how they guided the formulation of problem statements and lead the participants to develop and reformulate sub-questions relating to the overall problem statement during the workshop. One of the main challenges in this respect is to help participants make tacit anticipation and knowledge explicit (Kunseler et al., 2015; Taylor et al., 2015; Rasmussen a, 2011; Polanyi,

1966). In other words, the engineering students are asked to describe if and how they learned to use written, oral, graphical and electronic modes of communication to guide the workshop participants' emerging understanding of the problem.

- *Initiation of creative processes.* The engineering student facilitators must be able to describe in detail how they prepared and used so-called 'ice-breakers' and other creative techniques learned during the first part of the course. Thus, the students should describe and discuss in their report any techniques they used to promote a positive environment for the participants' creative thinking, and which helped the participants to surface unacknowledged observations and ideas and create new potential solutions.

- *Enforcement of implementation options and support of an operational action plan.* The engineering student facilitators must provide examples of how they learned to guide action planning through asking critical questions about goals, milestones, required resources, potential obstacles, how to overcome those obstacles, and finally, expected outcomes. Once an obstacle is spotted, they should be able to demonstrate how they helped the participants to identify ways of coping with it. For instance, they may have helped them identify surplus resources and/or find incentives and rewards for sustained and purposeful action-focused agreements. The cognitive skills learned in this respect include systematic thinking and guidance in helping the participants make realistic action plans for implementation.

- *Overcoming 'dead ends'.* Throughout the workshop, the students should use various communication techniques to encourage the participants when they encounter 'dead-ends' – that is, situations where they repeat themselves endlessly. Such techniques could include, for example, echoing, paraphrasing, encouraging, balancing, linking and logical marshaling as well as summarising temporary or final agreements/disagreements (Rasmussen c, 2011; Kaner, 2007; Heron, 2000). In their report, the engineering student facilitators are asked to provide examples of how they have used some or all of these communication techniques. Another skill they should document, if possible, is how they managed to help the participants bring scattered suggestions together to form a more integrated narrative, which may help them see the bigger picture or point more clearly (Egan, 2010). The learned cognitive skills include active listening, conflict resolution and cognitive empathy, meaning the ability to 'read' what another person is thinking, even when this thinking is only fragmentarily expressed.

The six engineering students described in the example demonstrated those cognitive facilitation skills very convincingly before, during and after the workshop described in detail in their report and confirmed by the client's contact person as well as two of the workshop participants.

Most of these cognitive skills for teamwork and communication are also described in the CDIO Syllabus for rethinking engineering education regarding personal, professional and interpersonal skills (Crawley et al., 2014:55-60). In particular, 'communication in foreign language' included in the CDIO syllabus is also relevant for both Danish and international engineering students, because the majority of the engineering students attending our course are not native-English speakers and the course is conducted in English. However, one skill -critical for facilitators- is not explicitly included in the CDIO syllabus: namely, *emotional empathy*, which we will describe and discuss in the next section.

Emotional facilitator skills

The emerging student facilitators must learn to be alert to their own feelings. They must be able to show distress-free authority, which includes the ability to avoid transferring an old hurt-laden agenda into current situations (Egan, 2010; Humphrey, 2002; Heron, 2000; Postle, 1991). The skill of emotional empathy enables the facilitator to create an informal and open-minded atmosphere in which the participants can feel '*safe*' to express their sometimes antagonistic or negative feelings. However, the atmosphere should not only be safe but also *tense* in order to stimulate the participants to transcend conventional 'borderlines' and create new ideas.

At the *emotional level,* the student facilitators are asked to report on how they learned:

- To observe the *emotional energy and body language* of the participants: "…*It was striking how, at times, some very passionate moments or discussions occurred during the workshop. Even though the members have been working in the same organisation for so long, and have different levels of interactions, a lot of 'I did not realise this' could be observed in people's eyes"* (Ali et al., 2012:35).

- To cope with *heated discussions*. When dialogue seems to lose its focus and become chaotic for some participants, the emerging student facilitator may fear that the process is getting out of control. However, what appears to be chaos can actually be a prelude to creativity. The difficulty is in judging which is which. How is it possible to recognise the difference between degenerative confusion and diversity-stretching-our-imagination? The skilled facilitator would give 'chaos' a chance and wait with intervening for as long as the participants are seriously engaged in the dialogue. Such a 'groan zone' of 'confusion' or 'discomfort' frequently occurs as a consequence of divergent thinking (figure 2).
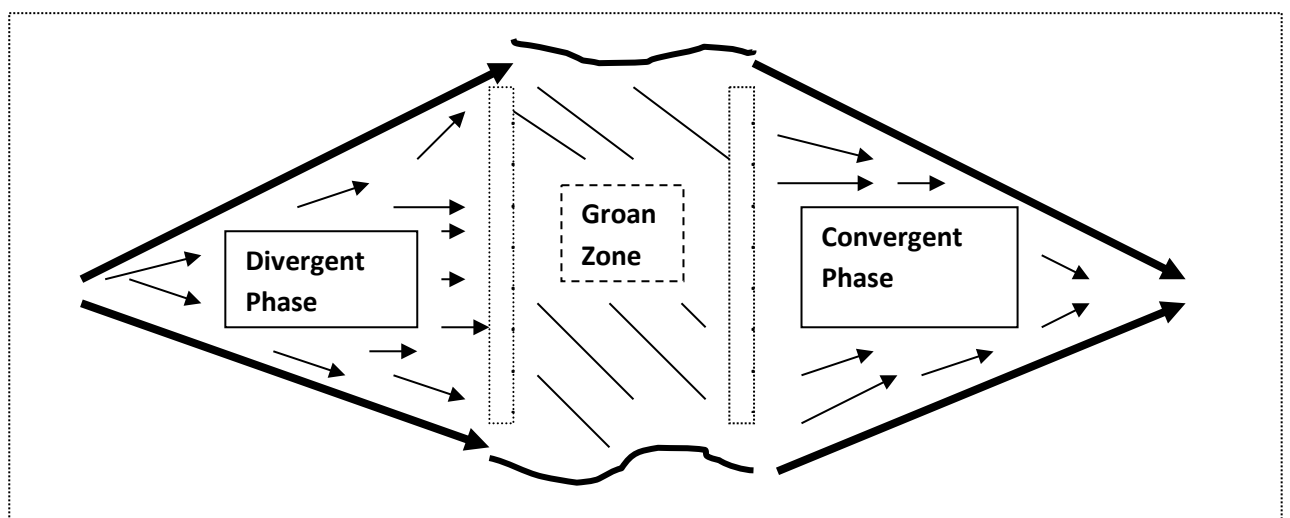
Figure 2: The 'groan zone' between divergent and convergent thinking (Rasmussen c, 2011; Kaner, 2007).

Because the engineering student facilitators were able to help workshop participants cope with the stress of being in the 'groan zone' (figure 2), they also helped them to discover the essential points

or ideas that should form the focus of the convergent thinking phase: "…*Sometimes 'heated' discussions could be observed but the facilitators never felt an urging need to intervene as stakeholders were disciplined enough to constructively find their own way through arguments, given enough time*" (Ali et al., 2012:35). The engineering student facilitators' are asked to give examples, if possible, of how they learned to be aware of the shifts in group dynamics, and when they should or should not intervene in the process. In other words, they should learn how to respond to the verbal and non-verbal emotional behavior of client-in-context (Egan, 2010).

The skill of using emotional empathy is not mentioned in the CDIO Syllabus for "Rethinking Engineering Education" (Crawley et al., 2014, Appendix A). However, in our opinion, omitting emotional skills prevents CDIO users from achieving a holistic understanding not only of creativity, but also of concepts like "trust and loyalty" and the "moral courage to act on principle despite adversity", which *are* skills listed in the CDIO syllabus (Crawley et al., 2014:73). In addition, the synergistic facilitation skills used to create collective resonance are also partly based on emotional empathy, which we describe and discuss in the next section.

The synergistic facilitator skills

Synergistic facilitation is promoted by the creation of *collective resonance*, which is based on bridging cognitive reasoning and emotional empathy. Facilitators operating only at the cognitive level may not be able to help the participants reach synergy because they will tend to neglect the positive or negative influences of emotions on ways of thinking. On the other hand, when only emotional empathy is used, the facilitation may focus too much on the feelings and too little on thinking.

The engineering student facilitators are asked to provide examples of how they learned to enable the workshop participants to be open to the different aspects of creative synergy and, possibly, find new ways of relating to one another. Regarding *collective resonance*, they observed as follows:

"… *The group synergy was evolving throughout the day….The ice-breaking games seem[ed] to bring them suddenly to a higher level of synergy….On the one hand, it can be argued that the critique phase suffered from a less synergetic group as it was at the beginning of the workshop. On the other hand, both the fantasy and the implementation phase[s] benefited from higher levels of synergy created during the critique phase*" (Ali et al., 2012:36).

This quote illustrates that the engineering student facilitators learned to observe different levels of synergy, and how synergy can emerge gradually from phase to phase in a workshop.

The facilitation skills creating collective resonance and synergy are not explicitly named in the CDIO Syllabus (Crawley et al., 2014). However, some skills that may support synergy are included, for instance "self-confidence", "courage" "thinking holistically" and "creative thinking". These potentially synergistic skills are not integrated, however, but scattered throughout as pieces of different items in the CDIO Syllabus. Therefore, it is unclear how creative synergy can be achieved if only the CDIO Syllabus is followed. Therefore, we suggest that the skills of using emotional empathy and collective resonance should be added to a programme like CDIO.

Comparison of Danish engineering students with students from multi-cultural backgrounds

Teaching facilitation to engineering students is already a challenging task, but instructing engineering students from differing cultural backgrounds is even more so. Half of the students who attend our course have a cultural background other than Danish. Engineering students from Canada, the US, China, Japan, Malaysia, Russia, Ukraine, The Baltic Countries, Norway, Iceland and EU member countries have participated in the course. This mix of cultural backgrounds is conducive to a multitude of different pre-course expectations. Some students prefer and expect formal lectures, while others prefer informal group work. Some expect that information about the facilitation approach will be provided to them – including the organisation they are supposed to collaborate with for the practical exercise of facilitating workshops. Others want to work completely independently from the teachers. Some resist the idea that the future can be constructed or is open at some level, while others believe that any general imagination about the future should be accepted as a possible organisational development activity. Some are committed to a religious belief system in which the future is determined by God, while others think that statistical-modelling forecast methods are the only proper way to study the future, rather than through the development of 'soft' workshop activities.

The students' multi-cultural backgrounds tend to provoke considerable paradigmatic discussion, especially at the beginning of the course. Naturally, this is important for the overall learning intentions, but it is also time consuming. As teachers, it is helpful to clarify the learning goals at the very beginning of the course and then discuss with the engineering student facilitators appropriate ways to achieve these goals – as well as less appropriate ways to do so. Examples of both are presented and discussed. Engineering students who have taken the course in the preceding year are invited back to tell the new students about what they learned from the course and how they managed to facilitate one or more workshops for a client organisation. Such feedback helps to convince the more sceptical students that it can be done successfully, but also warn them that significant challenges lie ahead during the course. The example described earlier in this paper shows that the international engineering student group were able to develop a common team spirit and find the courage to take contact with and suggest a workshop for professional Danish and/or international engineers who are much older and more experienced than themselves. When we compare the attitudes and behaviours of Danish engineering students with their international counterparts, the Danish students are more accustomed to working in project groups and taking initiatives. They also have a clear advantage because they know more about the prevailing organisational cultures in Danish companies than the international students do. In particular, the language barrier has been difficult for some of the international students to cope with when they contact companies. However, as described in our example in this paper, they often succeed in arriving at a compromise between Danish and English. Based on more than a decade of educational experience within this area, we can see that the international engineering students have significantly improved – also because their level of English seems to be improving. In addition, an increasing number of companies in Denmark are adopting English as their official workplace language as they employ more employees with international backgrounds.

What do both the Danish and international engineering students typically report that they have learned by taking the course? The most-cited positive learning experience is the challenge of applying one or more interactive facilitating methods in a *practical* context. Many of the students honestly admit that they were scared and nervous before facilitating a workshop, which was, for some, the first time they had run a workshop in their lives. However, as soon as they find that the participants accept them as process facilitators, the initial nervousness is typically transformed into a positive feeling of meaningful guidance of a problem-based group process. Another reported learning from the engineering students – both Danish and international – is the importance of being able to plan the workshop in detail, as the time schedule (figure 1) shows. In this respect, *trust and loyalty* among the group members in the facilitating group are reported to be vital. This is described as the internal trust in each member performing to the best of his/her ability and the mutual loyalty in actively working to make other group members' facilitation contributions successful. This is especially so in the international groups or mixed Danish-international groups where the group members are collaborating for the first time, and a lot of misunderstandings and distrust can arise from different members of the group starting with widely different ambitions and study habits. In such cases, we as teachers must intervene and mediate the sometimes emotionally heated discussions and disagreements within the group.

The Danish engineering students seem to be more willing than their international counterparts to use their emotional empathy to practise their facilitation during the workshop process. This is perhaps because they are more accustomed to the – often Danish – workshop participants' ways of thinking and feeling than the international students are. For some of the international students, especially those from universities with a greater power distance between older and younger people, it really is a boundary-breaking challenge to facilitate participants that are much more senior and professionally experienced than they are themselves. However, surprisingly often, the international engineering students frequently also learn to adopt the necessary guiding authority, and this experience seems to be an even greater learning process for them than for the Danish engineering students.

Most of the international engineering students agree that they would not be able to take such a course in their home countries. This is mainly because most of the interactive methods presented in the course are not taught by the universities in their home countries, and also because their home universities would not permit them to initiate an independent negotiation process with a large or small organisation without a formally agreed contract between the university and the client organisation. The students are often astonished to see that it is possible in a Danish context and that the negotiation often results in an agreement to run a workshop event. Even though it is not always easy to find an interested client organisation – especially for the international students whose networks here are weaker – all of our engineering student facilitator groups have succeeded so far in finding an organisation or group that lets them facilitate a workshop for all or some of their members. The majority of both the international and the Danish engineering students give the course positive feedback and several of them have reported back that they have used one or some of interactive methods introduced in the course in relation to their master thesis or in their professional job as engineers later on.

Possible shadow sides of facilitation

The concept 'shadow sides' was coined by Gerald Egan (2010). *Shadow sides* within an organisation are defined as all those things that adversely affect the facilitation process and outcomes. Covert, vague or partly tacit beliefs and values may foster fragmented and selfish attitudes and thinking. Before sending the engineering students out to establish contacts and facilitate members of an organisation, the concept was exemplified and discussed in the classroom as part of the exercises in phases 1, 2 and 3 of the course.

One shadow side is grounded in a *passive mentality of the facilitator*. A passive facilitator attitude can, for a short while, be a way to let the participants reflect in the groan zone (see figure 2). However, it can also leave the participants feeling unsupported and may therefore be counterproductive. It has the potential to leave them in a muddle of entangling inactivity instead of spending a shorter period in the groan zone between divergent and convergent thinking. The skilled facilitator must be able to distinguish between the productive aspects of being in a groan zone for a shorter period, and the counter-productive aspects of avoiding interventions at all in the belief that the participants must take responsibility (Egan, 2010). More specifically, they must actively help the participants to be concrete, brief and to the point.

Another shadow side is *covert manipulation* of the participants. As facilitators, it can be tempting to guide the participants towards results that have been agreed with the client-based manager or contact person before the workshop commences, but not explicitly communicated to the workshop participants. Before the engineering student facilitators contact potential clients, examples illustrating such ethical dilemmas are introduced and discussed with them (Rasmussen and Garibaldo, 2011). In their report, they are also asked to reflect on how they managed to avoid covert manipulation.

A third shadow side is *client or participant inertia* or a reluctance to start the change process – even though it has been decided to do so. The kinds of inertia are ranging from pure sloth, getting trapped in vicious circles, learned passivity, and self-defeating talks to fear of losing power within the organisation (Kunseler et al., 2015; Egan, 2010). Organisations can unlearn observable behaviour. However, it turns out to be more difficult to unlearn what is deeply embedded and often tacit within organisational attitudes and structures (Mon and Ruona, 2015).

A fourth shadow side is *client entropy* or the tendency of things to fall apart. It is the tendency to give up on action that has been initiated. Action plans for change, even those that start with engaged and enthusiastic motivation, sometimes dwindle or disappear. What seemed so easy during the workshop may seem difficult during the implementation process. Prevailing preferences can create problems for the legitimacy of new action plans (Kunseler et al., 2015; Rasmussen c, 2011).

How can we as teachers help engineering student facilitators cope with shadow sides? In some of the exercises they are asked to discuss examples of how shadow sides can manifest in practice, and how they might be handled. Afterwards, they are given concrete feedback on their suggestions for handling shadow sides in the simulated exercise. In their report, the students are asked to provide examples of how they learned to cope with typical shadow sides or process obstacles in the movement from idea to action. In particular, finding the balance between

intervening or not is often discussed by the engineering student facilitators in their report. Both Danish and international engineering students often reflect that they should have intervened more in some situations and less in others. These reflections are important aspects of the learning process. The fact that they reflect on their own shortcomings in certain situations and honestly admit it in their report positively indicates that an important learning process has taken place.

The relevance in a distributed leadership perspective

The course helps engineering student facilitators develop facilitative skills which may be useful for their later careers, especially if they take on a role in an organisation with a *distributed leadership* (DL) culture. However, distributed leadership is far from always easy to implement in an organisation. It is frequently opposed for at least three reasons. *First*, some leaders oppose it because they view it as a threat to their authority. *Second*, members of an organisation that have the desire to be a charismatic "hero", able to solve their problems may disagree with it. *Third*, some leaders reject it because they believe it is less efficient and less productive than a command-and-control process (Rasmussen a., 2011; Rasmussen, 2002).). The engineering students attending our course discuss these potential barriers to conducting successful facilitation, as well as how to cope with them in practice. Facilitating leaders can be viewed as bridge builders with a particular ability to develop divergent and convergent knowledge-developing processes (Macoby and Heckscher, 2007; Kaner, 2007). As with all types of leadership, facilitation does not occur in a vacuum (Taylor et al., 2015), but needs to be formed and adapted to specific organisational development purposes (Rasmussen c, 2011; Kaner, 2007; Schein, 2004; Hogan, 2002; Weaver and Farrell, 1997). The question of democratic effectiveness promoted by facilitating leadership is not merely an idealistic fantasy (Isaacs, 1999). Literature has drawn attention to the connection between a more democratic culture and increasing organisational effectiveness. However, as pointed out by Woods and Gronn:

"DL offers only a <u>necessary</u> view of organisational leadership, while a <u>sufficient</u> one would be one that furthered the realization of democratic ideals in day-to-day organizational practice", (Woods and Gronn, 2009:431)

For instance, it has been claimed that distributed leadership can enhance the organisational capacity to deal with increasing challenges of complexity by supporting new ideas and increased engagement among the members to initiate and sustain organisational development (Hoch, 2013; Woods and Gronn, 2009; Woods, 2005; Ruddock and Flutter, 2004; Mumford, 2000; Dewey, 2005/1916). Allowing employees to participate in organisational development can positively enhance their perceptions of leader fairness and their motivation to continuously contribute new suggestions (Ritter et al., 2014). The skills needed to be facilitating leaders are, as exemplified above, a combination of cognitive, emotional and synergistic skills. As process guides, they must become good listeners and mediators able to help people express their opinions and ideas in collaborative dialogues. Facilitating leaders should also be able to identify and mediate tensions and potential conflicts of interest with informal communication and interactive methods – before those tensions surface openly as issues within the organisation. Finally, they must be educated to use interactive methods -as our course does- to enhance idea development and implementation in

accordance with specific long and short-term needs and opportunities. We believe our example and conceptual reflection on facilitating skills in this paper can foster further discussion among engineering teachers and leadership researchers to enhance further empirical studies on the dynamic relations between cognitive, emotional and synergistic facilitating skills and practices.

Further research

It is recommended that further research be carried out to investigate how courses for students from multi-cultural backgrounds can channel this *student diversity as a positive resource* rather than a time-consuming barrier to effective learning of facilitation. Our experience is that a mix of international engineering students within the same group can result in tension and even conflicts, often due to different working styles and attitudes to responsibility. At other times, such a mix creates more engagement and synergy, as occurred with the group described in this paper. Although we, as teachers, have more than ten years of experience in conducting the course, we are not yet able to completely predict whether negative or positive group dynamics will evolve within different groups during the course. Therefore, a systematic research project focusing on the relationships between the different cultural backgrounds of the group members and group dynamics is recommended. It would also be relevant to carry out further research on how engineering students' initial views impact on their success in meeting the desired learning outcomes. Different cultural backgrounds may especially be experienced as a collaboration problem in online communities or with virtual teamwork. Therefore, it is recommended that further research be carried out to investigate and identify appropriate ways of conducting effective facilitating leadership in online communities, as well as how this research can be used to initiate more courses like the one we have presented in this paper (Rasmussen, 2012, Jameson, 2009).

Another area for further research is how technical universities can improve their capabilities to prepare their students to become not only technical specialists, but also leaders able to communicate and sustain continuous learning among their subordinates and for themselves. The CDIO and PBL educational programmes are promising approaches but could perhaps be extended to also include skills of emotional empathy and collective resonance. The four frameworks suggested by Glyn Thomas (2008) combining instrumental, intentional, person-centred and critical facilitator education goals suggest a combination of different ways of knowing partly beyond the approach suggested by CDIO and PBL. In particular, knowledge achieved through using intuition and imagination (gnosis) is very important to use in facilitating leadership in order to be able to react (or not react) more or less spontaneously to critical events that arise suddenly in day-to-day work situations or within a workshop. This paper could perhaps stimulate further inquiry into how facilitators can learn to attune to combined cognitive and emotional facilitation skills in order to become more effective and reflective facilitating leaders. Selected literature seems to assume that our behaviour is more valid when 'doing' (techne), 'understanding' (scientia), 'being' (praxis), 'relating' (relatio) and 'seeing' (gnosis) are congruent with each other (Wilson, 2009; Levi, 2003; Heron, 2000; Inayatullah and Wildman, 1996). However, it is still far from clear what 'congruent' means in this connection. More

research is needed to investigate this item in order to enhance a more precise combination of the different ways of knowing in facilitating leadership.

Conclusion

As future professional engineers, engineering students will be exposed to more inter-disciplinary teamwork. This is due to increasing inter-organisational alliances and the rising challenge to include additional climatic/environmental aspects in the usual technological and economic focus areas. Therefore, the CDIO and PBL approaches of "rethinking engineering education" are most relevant and necessary. We fully agree with their intentions to re-introduce problem-based and practical contexts into engineering students' educations. Their focus on inter-disciplinary teamwork is also highly recommended. However, we believe that learning facilitating leadership presupposes that the cognitive frames of CDIO and PBL must be extended to also include emotional empathy and collective resonance. Emotional empathy is especially important as a core component of facilitative leadership for at least one reason, namely the still-more recognised need to focus on the interplay between thinking and feeling in order to create a creative group dynamic in online and face-to-face teamwork. Below the surface of cognitive techniques and methods lies an entire field of vibrating emotions which are fundamental to facilitating in a way that maximizes the collective resonance of the group (Wilson, 2009; Levi, 2003).

The interactive methods used in the course have been successfully applied within companies of various sizes, public institutions, employer organisations, trade unions, virtual networks and non-governmental organisations. The proper use of interactive methods depends on an ability to assess the level of problem complexity before deciding if or how interactive methods should be used. A successful outcome also depends on the facilitators' capabilities in creating positive emotional settings maintained by respectful, open, and honest communication as well as a prevailing spirit of congeniality (Miles, 2012; Rasmussen a, 2011; Gastil, 1994; Barber, 1984). During the course, the Danish and international engineering student facilitators learned the importance of being clear, unambiguous, and supportive in guiding the workshop participants. They also learned to apply sensitivity and empathy, when and how to engage with high visibility, and when to fade away and 'step back' while group members' idea-creation and decision-making processes are underway (Jameson, 2009). As potential future leaders, they have taken the first steps towards becoming professional facilitators, and transforming group dynamics towards increasingly synergistic effectiveness. Whether our future professional engineers are to join top management teams, inter-disciplinary task forces, multi-cultural project teams and/or trans-disciplinary community entrepreneurial groups, they will (either as facilitators or simply team members) need to acquire not only cognitive reasoning but also emotional empathy. These are essential to help the group develop a higher level of collective resonance and synergy and thus create more organisational capacity to deal with challenges of complexity. The rising globalization of workplaces and companies requires that engineering students be prepared for jobs characterised by frequent international and multi-cultural communication and extended distance collaboration (Crawley et.al. 2014, Rasmussen a, 2011, Jamison, 2009). Very few corporative strategies and plans work as expected, however carefully they are prepared. Hence, they most often have to be modified and changed. Such

modifications can only be carried out successfully, when members of the organisation are motivated and sufficiently skilled to react effectively on the deviations from the proposed strategies or plans. To deal with the challenges of fast changing economies facilitation of distributive leadership has to be considered as part of a more comprehensive paradigm including the rationale of more motivated and interactive employees and less top-down power hierarchies. Such a rationale can be implemented by using interactive methods, as for example the methods the engineering students learn to use in our course. Only when human resources resident in the members of the organisation are activated and energised, the organisation becomes an innovative and effective 'player' in a complex and dynamic environment.

Appendix

The interactive methods referred to in the example describing how a group of students facilitate a group of facilitators are briefly described below, and more extensively in the textbook: Lauge Baungaard Rasmussen (ed.) 2011, *Facilitating Change – Using interactive methods in organisations, communities and networks.*

Interactive Planning (Zaza Nadja Lee Hansen and Lauge Baungaard Rasmussen). Interactive planning (IP) is a framework usable to achieve agreements in complex social systems, in which individuals have various opinions and experiences. It can be divided into the following steps: A) Formulating the mess, in which the relevant problems and challenges are identified and a reference scenario is elaborated on. B) End Planning, in which the idealised design of a desirable future is made. C) Means planning, in which the means to diminish the gap between the idealised design and the reference scenario are identified. D) Resource planning, in which the necessary resources to move from the present situation to the idealised scenario are decided. E) Implementation of the plans to realise the idealised scenario. F) Control, in which it is ensured that the organisation is moving in the desired direction. IP has been used to deal with topics like policy and strategy development in local communities, corporations and governmental as well as non-governmental organisations in order to promote organisational change, and urban or rural planning related to environmental and social issues. IP is developed on the fundamental belief that it is possible to achieve agreements even when the participants have different norms and interests.

Design Games (Eva Brandt). Exploratory Design Games (EDG) belong to a field of participatory design, where the direct involvement of users (the people intended to use the design) is essential. In a playful way, EDG sets an agenda for collaborative inquiry and assists the players in creating (for instance) new services, material products or common visions for possible futures. There are four board game formats used to identify issues that one should be aware of when using EDG for various purposes: A) The User Game creates stories about people as prospective users. B) In the Landscape Game, the focus shifts from developing stories about a person and considering his or her interests and relations, to involving the physical and social surroundings. C) In the Technology Game, the aim is to develop technology or projects where technology plays an important role in the activities and environment for the intended design. D) In the Enacted Scenario game, the intention is to develop designs in which persons, surroundings and technologies from the previous games are placed in a condensed scenario. EDG has been used in companies to support product development, IT-implementation and to improve organisational collaboration between people with various experiences. It has also been applied in architectural and urban planning approaches in order to gain new insights and develop a common strategy for the future. EDG is powerful because it helps to create an informal and playful atmosphere which can be very productive in creative work.

Future Workshop (Norbert R. Müllert). The aim of Future Workshop (FW) is to help the participants explore new ideas and new ways of forming their future. In general, FW can be divided into the following steps: A preparatory phase, in which the topic is decided on and the practical arrangements are agreed upon. A critique phase, during which all the grievances and negative experiences related to the chosen topic are brought out into the open forum. A fantasy phase in which the participants come up with their ideas, fantasies and changing views in response to the problems. An implementation phase, where the participants critically assess the potential of their ideas and projects being implemented. FW has been used in various settings – such as research and education institutions, non-governmental organisations, companies, trade unions and public administration. It offers participants the opportunity to draw up a future which is desirable and possible for them to implement – all by thinking the 'impossible'.

Search Conference (Francesco Garibaldo). Search Conferences (SC) help participants with divergent interests generate new perspectives, new options and new capabilities in order to overcome cooperation difficulties among members of an organisation or group. They consist of the following steps: A) Problem setting and trust building, in which the goals and questions are negotiated and agreed upon. In addition, a steering committee is formed, and the practical arrangements are made. B) The diagnosis, in which a shared understanding of the situation is achieved. C) The deliberation, where a shared concept of change is developed. D) Follow-up, in which the outcomes are implemented. The method has been used to facilitate the development of a common cultural and social identity, thus improving the level of collaboration and knowledge sharing in enterprises, governmental institutions and non-governmental organisations and networks. The knowledge generation facilitated by the use of SC occurs at least in two ways: directly as a collective memory and indirectly through the written report, the assembly discussion and the communication with the organisers of the specific approach.

Interactive SWOT Methodology (Luc V. Zwaenepoel). SWOT means the analysis of organisational Strengths, Weaknesses, Opportunities and Threats. The aim is to identify the internal and external factors that may affect desired future outcomes. There are two main parts of the SWOT process: A) The SWOT Inventory serves to give the participants an overview of the problem situation by using an inventory matrix to highlight the internal strengths and weaknesses as well as the external opportunities and threats. B) The SWOT Analysis builds upon the results from the SWOT inventory session in order to find strategies that draw on identified strengths and opportunities to combat weaknesses and threats. The method has been applied for strategy development in the military, governmental agencies, project planning in small and medium-sized enterprises, regional planning and organisational development. As a participatory strategy and planning approach, SWOT is usable to help the organisation focus on specific areas and prioritise possible actions which can be formalised in a Strategic Vision paper.

Community Building through Dialogues (Kavita Mehra). Dialogue is the key feature that distinguishes participatory approaches from other development and change approaches. By opening up the communicative space and bringing issue stakeholders together, it is possible to increase knowledge building and social change in organisations and communities. A dialogue conference consists of the following sessions: A) Common problem formulation and creation of homogeneous groups. B) Analyses of the causes of the different problems. C) Discussion about how to solve the problems based on their designated priority. D) Discussion about an agreement on how to work with the development tasks in practice after the conference. E) Focus on how ongoing improvements and competency development can be achieved. Dialogue workshops have been applied in companies and local communities.

Interactive Scenario Analysis (Lauge Baungaard Rasmussen). Scenarios are pictures of possible futures. Interactive Scenario Analysis (ISA) is a method for creating scenarios that help

stakeholders navigate towards desirable futures. ISA consists of the following phases: A) The constitutive phase, in which the focal issue is defined and the practical arrangements are planned. B) The problem-focusing phase, in which the focal issue is divided and specified as several sub-issues. C) The scenario-building phase, in which scenarios are developed. D) The back-casting phase, in which several connections and paths are made between the scenarios and the current situation. E) The action-planning phase, in which strategies and action plans to achieve the scenarios are developed. The method has been used in various settings, such as strategy development in the military, large business corporations, national planning, regional planning design and innovation projects and organisational and technological development. In its participatory form, it is a powerful tool to challenge conventional assumptions about future possibilities and remove obstacles of creative imaginations.

Causal Mapping (Mette Sanne Hansen and Lauge Baungaard Rasmussen). Causal Mapping (CM) is a method used to map and analyse how a person thinks and relates to different issues. CM can be used to structure information, experiences, opinions and viewpoints for participatory problem solving. It consists of the following steps: A) A planning meeting where an initial view of the situation is achieved and the possible outcomes are identified. B) Interviews of the key persons in order to obtain their viewpoints and opinions about the situation. C) Development of individual maps based on the interviews. D) Check-back interviews to receive the interviewees' responses to the provisional maps. E) Merging the individual maps into a common map, including all key persons' maps. E) Presentation and interpretation of the common map together with the key persons. F) Action planning and implementation, where targets are allocated to the relevant actors for implementation. CM has been used for different purposes – such as strategy development in small companies or non-governmental organisations, sense-making processes in small groups, and the implementation of IT solutions and change in organisations.

Improvisational theatre (Henry Larsen). Improvisational theatre is a powerful way of working with processes of organisational change. Brief plays enacted by professional actors can serve as invitations for mutual improvisation with participants from client organisations; as many as several hundred people can take part. Improvisational theatre is influenced by forum theatre, but takes another route in interpreting the dynamics of change. Organisations are constantly recreated through local interactions among people, where power relations, seen as dependency, are inevitable. The processes of relating involve responding to each other in recognisable and yet surprising ways; that is, with spontaneity. Improvisational theatre serves as an invitation to spontaneity, enabling risk-taking in interactions and awareness of changes in each other's reactions, because the apparently fictitious nature of the work makes it feel safe to do so. However, since the participants' contributions to this mutual improvisation are based on their reality, the work becomes a kind of 'fictitious reality', from which new insights can emerge that have the potential to change the configuration of relations between people. The reflections are based on the author's work in a Danish consultancy called the Dacapo Theatre; here, a particular relation to one client is explored as a process of learning.

The Chronicle Workshop(Hans Jørgen Limborg and Hans Hvenegaard). The Chronicle Workshop (CW) is a methodology developed to maintain and document the important features of a specific period of time in a specific organisation. The focus is on the important events which have shaped the changes, development and persons who brought it along and gave it flesh and body. The focus is also on the dilemmas, conflicts and breakthroughs that later proved to explain why and how history was created. CW consists of the following phases: A) The preparation of the workshop, including agreement on purpose, selection of participants and the writing of a programme. B) Conducting the workshop, including the participatory process of telling about important events, important people and significant issues during a specific period of time. C) Forming the future by reflecting on past

events, people and issues. D) Discussion and agreement on issues that should be omitted or promoted in the future. It has been used to enhance organisational processes of change in companies and public institutions. CW makes it possible for the members of an organisation to receive a coherent story about an organisation instead of the usual fragmented, everyday anecdotes. In this way, they may be able to jointly reflect on the background of the prevailing norms and values of the organisation and discuss possible changes for the future.

The Dominance of Dialogical Interview Research (Steiner Kvale). Over the past few decades, the dialogical interview has become a sensitive and powerful method for investigating a number of issues. The author discusses the possibility of this form of interview also entailing soft forms of power relations. As a contrast to a neglect of power relationships, the author depicts various forms of agonistic interviews, which deliberately play on power differences. He then addresses societal contexts of interviewing and, drawing on the use of dialogues by the exercise of power in politics, management and education. Finally, he discusses interviews in relation to seductive forms of manipulation.

References

Adams, T., and J. Means. 2006. "Accelerating the project Lifecycle: The partnership of facilitation and Project Management", *Annual San Diego- Pfeiffer and Company,* No. 2: 227-240.

Agostino, D., M. Arena, and M.Arnaboldi. 2013. "leading change in public organisations: the role of mediators", *Leadership & Organization Development Journal,* 34(7): 596-615.

Alexander, I.F., and N. Maiden, N. (eds.). 2004. *Scenarios, Stories, Use Cases – Through the System Development Life Style.* Chichester: John Wiley & Sons, Ltd.

Ali, S., A. Alvarez, A. Caille, C. Lott, L. Maier, and H.J. Park . 2012. *Strategy and planning methods, Future Workshop.* DTU Management Engineering, DK. Unpublished report.

Andersson, N. and P.H. Andersson. 2010. "Teaching professional Engineering Skills: Industry Participation in realistic Role Play Simulation", *Making Change last: Sustaining and Globalizing Engineering Educational Reform (Vol. Proceedings of the 6th International CDIO Conference).* Montréal, Canada: École Polytechnique

Aneas, A. 2015. "Transdisciplinary technology education: a characterization and some ideas for implementation in the university" *Studies in Higher Education,* 40(9):1715-1728.

Argyris, C. and D.A. Schön. 1996. *Organizational learning II: Theory, method and Practice.* US, Addison Wesley Publishing Company.

Barber, W., S.King, and S.Buchanan. 2015. "Problem Based learning and Authentic Assessment in Digital pedagogy: Embracing the role of Collaborative Communities", *The Electronic Journal of e-Learning,* 13(2): 59-67.

Barnes, B., J.H. Humphreys, J.D. Oyler, S.S.P. Haden, and M.M. Novicevic. 2013 . "Transcending the power of hierarchy to facilitate shared leadership", *Leadership & Organization Development Journal,* 34(8): 741-762

Baumgartner, L.M. 2001."An update to transformational learning. *New Directions for Adult and Continuing Education.* 89: 15-24

Bennedsen, J.; F. Georgsson and J Kontio. 2014. "Evaluating the CDIO Self-evaluation" *Proceedings of the 10th International CDIO Conference,* Universitat Politécnica de Catalunya, Barcelona, Spain, June 16-19, 2014

Boisot, M. 1998. *Knowledge assets: securing competitive advantage in the information economy.* New York, Oxford University Press.

Boud, D.J. and G.I. Feletti. 1997. *The challenge of problem-based learning (2nd ed.).* London, Kogan Page.

Brandt, E. 2011, "Participation through Explorative Design Games". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* LB Rasmussen (ed.) 213-256. Lyngby, DK: Polyteknisk Forlag.

Bussey,M. 2014. "Concepts and effects: ordering and practice in foresight", *Foresight,* 16(1):1-16

Calof, J., R. Miller and M. Jackson. 2012. "Towards impactful foresight: viewpoints from foresight consultants and academics" *Foresight,* 14(1): 82-97

Castells, M. 2000. *The Information Age: Economy, Society and Culture. Vol. I: The Rise of the Network Society (2nd Edition).* Oxford, UK: Blackwell Publishers.

Caulfield, J., and T.Woods. 2013. " Experiential learning: Exploring its long-term impact on socially responsible behavior", *Journal of the Scholarship of Teaching and Learning,* 13(2): 31-48

Chan, C.K.Y. 2016. "Facilitators' perspectives of the factors that affect the effectiveness of problem-based learning process", *Innovations in Education and teaching International,* 53(1):25-34.

Cloutier, G., R. Hugo and R. Sellens. 2011. "Mapping the Relationship between the CDIO Syllabus and the CEAB graduate Attributes: an Update". *Proceedings of the 7th International CDIO Conference,* Copenhagen, DK.

Crawley, E.F., J. Malmquist, S.Östlund, D.R. Brodeur, and K. Edström, 2014. "*Rethinking Engineering Education – The CDIO Approach"*(Second Edition) Springer Verlag, Cham, Heidelberg, New York, London. DOI 10.1007/978-3-319-05561-9, (ebook)

Crawley, E.F., J. Malmquist, S.Östlund, and D.R. Brodeur, 2007. "*Rethinking Engineering Education – The CDIO Approach."* New York, Springer Verlag,

Guba, E.G. and Y.S.Lincoln. 1994. "Competing paradigms in qualitative research." In N.K. Denzin and Y.S. Lincoln (eds.), *Handbook of qualitative research,* 105-117. London, Sage.

De Graaff, E.2016. "The transformation from teaching to facilitation – experiences with faculty development training", *International Journal of Engineering Education,* 32(1): 396-401.

Denison, D.R., R. Hooijberg, and R.E.Quinn, 1995. "Paradox & performance: Toward a Theory of behave ioral Complexity in Managerial Leadership" *Organization Science* 6(5):524-540.

Dewey,J. 2005/1916. *Democracy and Education,* New York, Barnes & Noble.

Dewey, J. 1922. *Human nature and conduct. An Introduction to Social Psychology.* London, Allen and Unwin.

Eckerdal, A. 2015. "Relating theory and practice in laboratory work: a variation theoretical study". *Studies in Higher* Education, 40(5): 867-880.,

Edström, K. and A. Kolmos, 2014. "PBL and CDIO: complementary models for engineering education development" *European Journal for Engineering Education*, 39(5): 539-555

Egan, G. 2010. *The Skilled Helper – A Problem-Management and Opportunity Development Approach to Helping. (9th Ed.).* Belmont, US, Brooks / Cole, Cengage Learning.

Elliott, C.J., and M. Reynolds. 2014. Participative pedagogies, group work and the international classroom: an account of students' and tutors' experiences" *Studies in Higher Education,* 39(2): 307-320

Ellström, P-E. 2010. "Practice Base Innovation: a learning perspective". *Journal of Workplace Learning,* 22: 27-40.Fuller, T., and K. Loogma. 2009. "Constructing futures: A social constructionist perspective on foresight methodology". *Futures,* 41(1): 71-79.

Garibaldo, F. 2011. Search Conference. In *Facilitating Change – Using interactive methods in organisations, communities and networks,* LB Rasmussen (ed.) 187-212. Lyngby, DK: Polyteknisk Forlag.

Gastil, J. 1994. "A Definition and Illustration of Democratic leadership" *Human Relations,* 47(8): 953-975

Gray, D., and S. Williams. 2012. "Facilitating educational leadership: using frames to increase action", *Leadership & Organization Development Journal,* 33(6): 583-593.

Gregersen, L., T. Linde and J.G. Rasmussen. "Linking between Danish Universities and society", *Science and Public Policy*. 36(2): 151-156

Gronn, P. 2002. "Distributed leadership as a Unit of Analysis", *Leadership Quarterly*, 13(4):423-451

Gronn, P. and A. Hamilton. 2004. "A Bit More Life in the Leadership – Co-Principalship as Distributed Leadership Practice". *Leadership and Policy in Schools,* 3(1): 3-35

Hallanga-Brink, S. and I. Vervoort. 2015. "Higher Education Institutions as international hubs in Community Service Engineering Innovation Networks – A European Lifelong Learning Program project" *E4S Conference Leuven (B)* June 18&19, 2015: 34-40

Hamilton, C. 2004. "Come together: The mystery of collective intelligence" *What is Enlightenment,* 25: 56-77.

Hansen, M.S., and L.B. Rasmussen. 2011. "Causal Mapping". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* L.B. Rasmussen (ed.) 257-284. Lyngby, DK: Polyteknisk Forlag.

Hartley,D. 2007. "The Emergenc e of Distributed leadership in Education: Why Now?" *British Journal of Educational Studies,* 55(2): 202-214

Hartman, N.S., S.J.Allen, and R.F. Miguel. 2015. "An exploration of teaching methods used to develop leaders – leadership educators' perception", *Leadership & Organization Development Journal,* 36(5): 454-472.

Hedman, E. and M. Valo. 2015 "Communication challenges facing management teams", *Leadership & organization Development journal,* 36(8):1012-1024

Heijden, K. vd. 2004/ 1996. *Scenarios: The Art and Practice of the Learning Organisation.* Chichester, UK: Wiley.

Heron, J. 2000. *The complete facilitator's handbook.* London: Kogan Page Limited

Hertel, G.2011. "Synergetic effects in working team", *Journal of managerial Psychology,* 26(3):176-184

Hoch, J.E. 2013. "Shared Leadership and Innovation: The Role of Vertical Leadership and Employee Integrity." *Journal of Business Psychology,* 28: 159-174.

Hodgson, V., and J. Zaaiman. 2003. "Facilitative project Management: Constructing a Model for integrated Change Implementation by utilizing case studies", *South African Journal of Human Resource Management,* 1(9), pp. 45-53.

Hogan, C. 2002. *Understanding facilitation: Theories and principles.* London. Kogan Page.

Humphrey, R.H. 2002. "The many faces of emotional leadership", *The leadership Quarterly* 13: 493-504.

Illeris, K. 2007. *How we Learn – Learning and Non-learning in School and Beyond.* New York: Routledge.

Inayatullah, S. and P. Wildman. 1996. Ways of knowing, culture, communications and the pedagogies of the future. Available at *www.metafuture.org*.

Isaacs, W. 1999. *Dialogue and the art of thinking together*. New York, Doubleday.

Jameson, J. 2009. "Distributed leadership, Trust and Online Communities" in Ozok A.A. and P Zaphiris (Eds.). *Online Communities,* LNCS 5621: 226-235, Springer Verlag Berlin Heidelberg.

Jensen, K.R. 2011. "Creating Global Opportunities through Cross-cultural Colaboration", *The International journal of Knowledge, Culture and Change management,* 10(10): 33-42.

Jönsson, S. and T. Schölin, 2014. "Potential facilitators of workplace learning in a TPS based company", *Journal of management Development*, 33(10): 1004-1018

Kaner, S. 2007. *Facilitator's Guide to Participatory Decision-making.* New York: Wiley.

Katz, R.L. 1963. *Empathy: its nature and uses,* London, Free press of Glencoe.

Kellett, J.B., R.H. Humphrey and R.G. Sleeth (2002*).* "Empathy and complex task performance: two routes to leadership" *The leadership Quarterly*, 13: 523-544.

Kolmos, A. and E. de Graaff.2013. "Problem-based and project-based Learning in Engineering Education – Merging Models." In *Cambridge Handbook of Engineering Education research (CHEER);* Edited by A Johri and B.M. Olds, 141-160. New York, Cambridge University Press.

Kolmos, A. 1996. "Reflections on project Work and Problem-based Learning." *European Journal of Engineering Education*, 21(2): 141-148.

Kunseler, E.; W. Tuinstra, E. Vasileiadou, and A.C.Petersen. 2015. "The reflective futures practitioner: Balancing salience, credibility and legitimacy in generating foresight knowledge with stakeholders" *Futures* .66:1-12. Available at: http://dx.doi.org/10.1016/j.futures. 2014.10.006

Krause, K.-L.,D. 2014. "Challenging perspectives on learning and teaching in the disciplines: the academic voice". *Studies in Higher Education,* 39(1):2-19

Lam, A. 2011. "University-industry collaboration: careers and knowledge governance in hybrid organizational space" *International Journal Strategic Business Alliances*, 2(1/2) : 135-145

Lave, J and E.Wenger. 1991. *Situated learning. Legitimate peripheral participation.* Cambridge, University of Cambridge Press.

Levi, R. 2003. "Group magic: An inquiry into experiences of collective resonance. *Dissertation Abstracts International, 64(7),* 2560A. Retrieved from ProQuest Dissertation and Thesis database. (AAT 3098829)

Limborg, H-J and H. Hvenegaard. 2011. "The Chronicle Workshop", In *Facilitating Change – Using interactive methods in organisations, communities and networks,* LB Rasmussen (ed.), 305-326. Lyngby, DK: Polyteknisk Forlag.

Lund, K., and J. Tingström. 2011. "Facilitating creative problem solving workshops: Empirical observations at a Swedish automotive company", *International Conference on Engineering Design (ICED 11)* 15-18 August 2011, Technical University of Denmark.

Macoby, M. and C. Heckscher. 2007. "A note on leadership for collaborative communities". In Heckscher, C and Adler, P.S. (Eds.) (2007), *The firm as a collaborative firm,* 469-478, Oxford University Press, UK.

Malmquist, J. 2009. "A Comparison of the CDIO and EUR-ACE Quality Assurance Systems." *Proceedings of the 5th International CDIO Conference,* Singapore Polytechnic, Singapore.

Margaryan, A., C. Milligan, and A. Littlejohn. 2013. "Managers as workplace learning facilitators", *International Journal Human Resources Development and Management,* 13(2/3): 206-223.

McCauley- , C., S.J.Willians, A.C. Gillon, and A. Braganza. 2015. "Making sense of leadership development: developing a community of education leaders", *Studies in Higher Education,* 40(2):311-328

Mehra, K. 2011. "Community building through Dialogues". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* LB Rasmussen (ed.), 285-304. Lyngby, DK, Polyteknisk Forlag.

Miles, J. 2012. "Dynamic foresight evaluation", *Foresight,* 14(1): 69-81.

Moon, H. and W. Ruona. 2015. "Towards a deeper understanding of strategic learning"*Leadership & Organization Development Journal,* 36(6): 667-674.

Mumford, M.D. 2000. "Managing creative people: Strategies and tactics for innovation". *Human Resource Management Review*, 10: 313-351.

Nafei,W. 2014. "Knowledge Management and Organizational learning from the Employee Perspectives: A study from Saudi Arabia Context", *Journal of Management and Strategy,* 5 (1): 73-87.

Neville, A.J. and G.R.Norman. 2007. "PBL in the Undergraduate MD Program in McMaster University: Three Iterations in Three Decades." *Academic Medicine* 82(4):370-374

Müllert, N.R. 2011. " Future Workshop". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* L.B. Rasmussen (ed.) 73-98. Lyngby, DK, Polyteknisk Forlag.

Nikolova, B. 2014. "The rise and promise of participatory foresight" *European Journal of Futures Research,* DOI 10.1007/s40309-013-0033-2, pp. 1-9

Nonaka, I., and H.Takeuchi, H. 1995., *The knowledge-creating company.* New York: Oxford University Press.

Pennington, D.D. 2011. "Bridging the Disciplinary Divide: Co-Creating Research Ideas in e-Science Teams", *Computer Supported Cooperative Work*, 20(3):165-196.

Polanyi, M. 1966. *The Tacit Dimension.* London: Routledge & Paul Kegan.

Postle, D. 1991. *Emotional Competence*. London: Wentworth Institute.

Putham, H. 2002. *The Collapse of fact/value dichotomy and other essays.* US, Harward University Press.

Raelin, J.A. 2012. "The manager as facilitator of dialogue", *Organization* 20(6): 818-839

Rasmussen, L.B. 2002. "Work process knowledge and creativity in industrial design". In *Work Process Knowledge,* N. Boreham, R. Samurcay, and M. Fischer (eds.) 74-94, London: Routledge.

Rasmussen, L.B. a. 2011. " Framing Interactive Methods". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* L.B. Rasmussen (ed.) 11-46. Lyngby, DK, Polyteknisk Forlag.

Rasmussen, L.B. b. 2011. "Interactive Scenario Analysis". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* L.B. Rasmussen (ed.), 99-140. Lyngby, DK: Polyteknisk Forlag.

Rasmussen, L.B. c. 2011. "The Art of Facilitation". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* LB Rasmussen (ed.), 397-424. Lyngby, DK, Polyteknisk Forlag.

Rasmussen, L.B. 2012. "Virtual teamwork – Panoptic or interactive work design". In *Pre-thinking Work: Insights on the Future of Work,* S. Jeschke, F. Hees, A. Richert, and S. Trentow (eds.). Wien, LIT Verlag.

Rasmussen, L.B., and F. Garibaldo, F. 2011. "Application of interactive Methods – Epistemology and Ethics". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* L.B. Rasmussen (ed.):47-72. Lyngby, DK, Polyteknisk Forlag.

Rhisiart, M. 2013. "Foresight and "grand challenges" within research and innovation policies", *Foresight,* 15(1): 29-39

Ritter, B.A., S.Venkatramen, and C. Schlauch. 2014. "A multi-level exploration of empowerment mediators", *Leadership & Organization Development Journal,* 35(7): 649-667.

Royal Academy of Engineering. 2007. *Educating Engineers for 21st Century.* www.raeng.org.uk/news/release/pdf/Educating_Engineers.pdf.

Ruddock, J. and J. Flutter. 2004. *How to Improve Your School: Giving Pupils a Voice.*london, Continuum.

Rush, G. 2007. *The FoCuSeD™ Facilitator Guide*. Chicago, IL, MGR Consulting.

Saad, M., C. Guermat, and L. Brodie. 2015. "National innovation and knowledge performance: the role of higher education teaching and training". *Studies in Higher Education,* 40(7): 1194-1209

Salovey, P. and J.D. Mayer. 1990. " Emotional intelligence". *Imagination, Cognition and Personality,* 9(3): 185-211.

Savin-Baden, M. 2003. *Facilitating Problem-based Learning: Illuminating Perspectives.* Maidenhead: Society for research into Higher Education. Open University Press.

Schein, E.H. 2004. *Organizational culture and leadership (3rd ed.)* New York, Wiley.

Schwartz, P. 1991. *The Art of the long View.* New York, Doubleday.

Schweitzer, J. 2014. "Leadership and innovation capability development in strategic alliances", *Leadership & organization Development Journal,* 35(5):442-469.

Searle, J.R. 1992. *The Rediscovery of the Mind.* Massachusetts, MIT Press.

Spencer, D., A. Zimmerman, and D. Abramson. 2011. "Special Theme: Project Management in E-Science: Challenges and Opportunities". *Computer Supported Cooperative Work,* 20(3):155-163.

Sobral, D.T. 1995. "The problem-based learning approach as an enhancement factor of personal meaningfulness of learning." *Higher Education,* 29:93-101

Spiess, H., E. Lobsiger-Kägi.,V. Carabias-Hütter, and A. Marcolla. 2015. "Future acceptance of wind energy production: Exploring future local acceptance of wind energy production in a Swiss alpine region" *Technological Forecasting & Social Change,* http//dx.doi.org/10.1016/j.techfore.2015.06.042

Stratigea, A. and V. Katsoni. 2015. "A strategic policy scenario analysis frameworkfor the sustainable tourist development of peripheral small island areas – the case of Lefkada-Greece Island". *European Journal of Futures Research,* available at http.// creativecommons.org/licenses/by/4.0/

St. Anne, S. 1999." A journey in search of facilitative communication". In White, S.A. (ed.): (1999). *The Art of Facilitating Participation.* 71-89. New Delhi, Sage Publications.

Surie, G and J.K. Hazy. 2007. "Generative leadership: Nurturing innovation in complex systems". In: hazy, J.K., Goldstein, J.A. and Lichtenstein, B.B. (Eds.) *Complex Systems leadership Theory- New perspectives from Complexity Science in Social and Organizational Effectiveness,* ISCE Publishing, Mansfield, US, 349-366.

Tassoul, M. 2011. " Creative process". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* L.B. Rasmussen (ed.) :373-394. Lyngby, DK, Polyteknisk Forlag.

Taylor, T.Z., J. Psotka, and P. Legree. 2015. "Relationships among applications of tacit knowledge and transformational/transactional leader styles – An exploratory comparison of the MLQ and TKML", *Leadership & Organization Development Journal,* 36(2): 120-136

Thomas, C.H. and R.R. Hirschfeld. 2015. "Knowing is half the battle – Interdependent effects of knowledge and action on leader emergence",*Leadership & Organization Development Journal,* 36(5): 512-526

Thomas, G. 2008. "Preparing facilitators for experiential education: The role of intentionality and intuition". *Journal of Adventure Education and Outdoor Learning.* 8(1):3-20.

Weaver, R.G. and J. Farrell. 1997. *Managers as facilitators: A practical guide to getting work done in a changing workplace.* San Francisco, Berrett Koehler.

Webster's New Encyclopedic Dictionary .1996. Cologne, Könemann.

Wilson, A.C. 2009. *Facilitators' perceptions of what contributes to group synergy and collective resonance.* Ph.D. dissertation, Saybrook Graduate School and Research Center, United States – California.

Winter, M., C. Smith, T. Cooke-Davies, and S. Cicmil. 2006. "The importance of 'process' in Rethinking project Management: The story of a UK Government-funded research network", *International Journal of Project Management* 24(8): 650-662.

Woods, P.A., N. Bennett, C.Wise, and J.A. Harvey. 2004. "Variabilities and Dualities in Distributed Leadership: Findings from a Systematic Literature Review", *Educational Management Administration & Leadership*, 32(4):439-457.

Woods, P.A. 2005. *Democratic Leadership in Education,*London, Sage.

Woods, P.A. and P. Groon. 2009. "Nurturing Democracy – The Contribution of Distributed leadership to a Democratic Organizational Landscape" *Educational Management Administration & leadership,* 37(4): 430-451.

Zwaenepool, L.V. 2011. " Interactive SWOT methodology". In *Facilitating Change – Using interactive methods in organisations, communities and networks,* L.B. Rasmussen (ed.):169-186. Lyngby, DK, Polyteknisk Forlag.