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Disentangling the Links between Individual Creativity and Group Performance

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Abstract

INTRODUCTION

The assumed link between creative actions and innovative outcome seems widespread in the literature which, however, remains scattered on the actual link (Cokpekin & Knudsen, 2012). Even if the relationship could be justified, research points to the lack of understanding of the linkages between individual and group level creativity and the link to creative and innovative outcome. This paper seeks to disentangle these links by investigating how individual creativity is affected by the group and how this in turn affects group creativity and performance, while making clear distinctions between dimensions of a multiple construct.

In the existing literature, the widespread definition of creativity in a business context includes the need for the creative outcome to be both novel and useful in order to potentially lead to innovation, but quite often the creative outcome is measured as a unitary construct, as shown by Sullivan and Ford (2010), leaving an unclear picture of the role of the different dimensions.

Additionally, Montag et al. (2012) emphasize the importance of separating process and product when studying multiple dimensions of both creative performance behaviors and creative outcome effectiveness to appropriately understand the nuances of creativity.

This paper conceptually addresses and empirically investigates creativity at individual and group level ? and as a multiple construct ? by looking at diversity, motivation, interaction, and performance among individuals working together on new product development.

DATA COLLECTION AND ANALYSIS

The collection of quantitative data for the paper started October 2012 and ends January 2013. The population consists of 213 5th semester students from 16 countries and 14 different engineering study programs meeting twice a week to work together on new product development and entrepreneurship. To encourage cross-disciplinarity the students have been grouped into 'businesses' of approximately 6 people. The aim of the project work is to develop new engineering solutions and to investigate the potential market hereof, thereby emphasizing issues of product development, innovation, marketing, project management, and team work. This set-up is designed to resemble real-life situations of how companies approach new product development, where group members are selected on the basis of an appropriate combination of skills, they work on tasks together and alone, their ethnic backgrounds may differ, both genders might be represented, etc. The empirical setting with a population of students is quite controlled and allows for some ideas of how individual creativity is related to group creativity and, ultimately, to innovative outcome, and also for some general considerations and implications.

A survey distributed at the start and the end of the project period focusing on both self- and other-ratings of the various dimensions, and, eventually, expert ratings, will be used to assess creative actions and outcomes of the work of the groups. Furthermore, the research team will have access to project evaluations, personal profile scores, collaboration measures, etc.

It is expected to contribute to the scarce literature on individual and group creativity for innovative outcome by following project progress, barriers, and personal traits of group members. The final paper seeks to disentangle the above described inter-relationships and aims to provide empirical answers to the role of creativity towards creative and innovative outcome.

KEYWORDS: creativity, diversity, motivation, communication, interaction, performance, product development.

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DISENTANGLING THE LINKS BETWEEN INDIVIDUAL CREATIVITY AND GROUP PERFORMANCE

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ABSTRACT

This paper conceptually addresses and empirically investigates creativity at individual and group level – and as a multiple construct – by looking at diversity, motivation, and performance among individuals working together in newly formed teams on new product development tasks. The paper contributes to the literature on individual and group creativity towards innovative outcome.

THE THESIS IN GENERAL

The complete data set for this paper will be available for analysis in January 2013, and therefore the present version of the paper is preferably assessed on the basis of its conceptual contributions and how these fit in with the overall research questions of the emerging PhD thesis. The thesis focuses on creativity in collaborative contexts for the purpose of linking individual and group level through two overall research questions:

1. *When and how is individual creativity either nurtured or restrained while collaborating with others in co-creative practices?*
2. *How much complementarity is beneficial for creative outcome and innovation performance?*

The aim of the thesis is to investigate groups of people engaging in different co-creative practices, while specifically emphasizing how diversity among group members, individual creativity, and individual motivation for being creative are linked to group performance and creativity, and to dimensions of creative outcome; hence, it responds to the above research questions.

A starting point of the thesis is that creativity can be appreciated as a prerequisite for innovation. Throughout the last approximately 80 years, scholars have added meaning to the notion of innovation. Schumpeter (1934) defined inventions and development as the making and carrying out of new combinations of existing resources, and added that the purpose of developing something new is to attain competitive advantages, which implies that innovation covers an economic exploitation of the invention. Also today, his view is commonly held among both innovation researchers and business professionals, and as such, innovation is typically defined as the transformation of ideas or inventions, including a demand for these to be successfully commercialized. Denning and Dunham (2010: xiii) make a further reaching definition, namely that *“innovation is the art of getting people to adopt change”*, indicating that it cannot be concluded whether a product is innovative before it has been obtained and adopted by its user. Thus, the willingness of people to adopt a new product is the key to successful innovation.

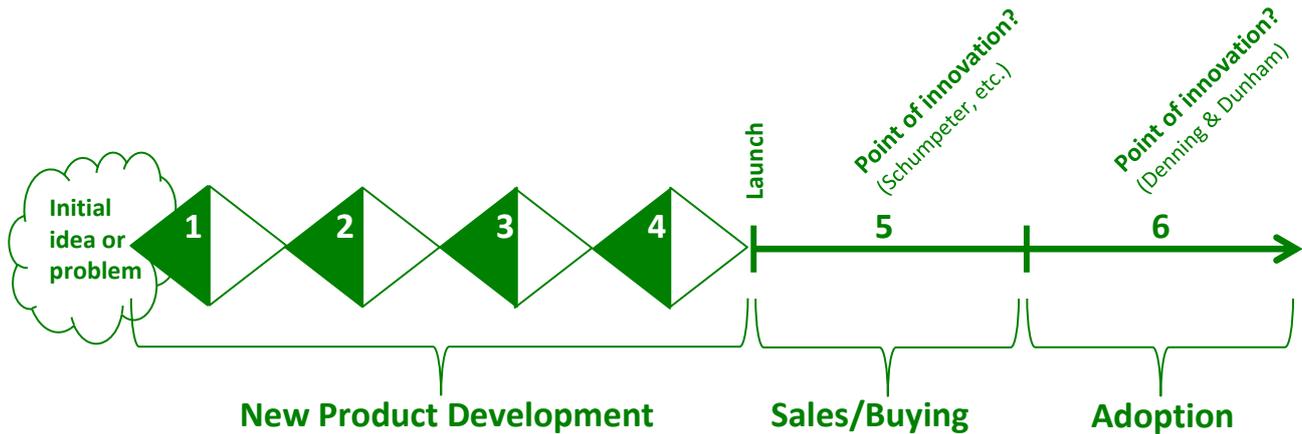


Figure 1: Timeline of a process of innovation.

Figure 1 visualizes a process of innovation, illustrating that the *point of innovation* is either according to the proponents of Schumpeter, holding the position that innovation happens when ideas are successfully commercialized, or according to Denning and Dunham’s theory where innovation equals the point when recipients have truly adopted a product. Either way, a creative outcome of new product development cannot be deemed innovative upfront, at the time of product launch. An organization’s creative performance does not equal its innovation performance, but creative outcomes of new product development might be important indicators of innovation potential.

Denning and Dunham (2006) mention that in 2005, the US magazine, Business Week, reported that 96% of innovation initiatives failed in meeting their financial objectives, indicating an urge for organizations to target their new releases in a better way. One particular way would be to zoom in on how individual members’ creativity unfolds in heterogeneous groups working towards a creative outcome, because this is quite often the set-up in organizations. In the following, a conceptual framework is presented for empirically investigating creative processes and outcomes of new product development in heterogeneous group and, among other things, suggesting that dimensions of creative outcome should relate to indicators of innovation performance.

MOTIVATING THE RESEARCH in the first paper

The assumed link between creative actions and innovative outcome of new product development seems widespread in the literature (e.g., Amabile, 1997), whereas the empirical evidence remains scattered on the actual link (Cokpekin & Knudsen, 2012). Even if the relationship could be justified, research points to the lack of attention towards the linkages between creative processes at, i.a., individual and group level (Hennessey and Amabile, 2010), and between creative processes and outcomes (Montag et al., 2012).

This paper seeks to disentangle some of these links by investigating *how individual creativity is affected by diversity of group members and how this in parallel affects group creativity and performance*, while making clear distinctions between dimensions of a multiple construct.

According to Horn and Salvendy (2006: 157) “creativity is broadly defined as the individual or group process that results in an artifact (solution, thought, product, art, music, etc.) that is judged as original and useful”. This is on par with the commonly used definition of creativity in a business context which includes the need for the creative outcome to be both novel and useful in order to potentially lead to innovation (e.g., Amabile, 1983; George and Zhou, 2001; Zeng,

Proctor, and Salvendy, 2010). The *novelty* aspect has to do with originality, emphasizing the need for the organization to be able to launch products that are new to existing or emerging markets. The creative outcome is *useful* to the extent that it is appropriate; it should meet needs and wishes of intended recipients and also be useful to the organization. A few scholars (e.g., Taggar, 2002) mention *valuable* as an aspect which again could be interpreted as being vital to both the organization and the recipients: internally, a creative outcome should fit into values and strategies of the organization, and externally the fit to recipients' life styles and values is important in order for those recipients to consider, buy, and adopt a new product.

Despite the multi-faceted definition of the creative outcome, it is quite often measured as a unitary construct, as shown by Sullivan and Ford (2010), leaving an unclear picture of the role of the different dimensions. Therefore, this paper follows Montag et al. (2012), who emphasize the importance of, henceforth, separating process and product when studying multiple dimensions of both creative performance behaviors (CPBs) and creative outcome effectiveness (COE). This distinction is not always clear in commonly used measures of creativity (e.g., George and Zhou, 2001), but appears to be critical when trying to understand nuances of creativity, and when assessing the causal influence of behaviors on outcomes. Montag et al. (2012: 1365) define CPBs as "*behaviors directed toward achieving organizational goals*" such as problem formulation, preparation/information gathering, idea generation, and idea evaluation, and COE is defined as "*the evaluation of the outcomes of these behaviors*" (e.g., an idea, a prototype, or a product) on the basis of novelty and usefulness. Thus, COE would be an evaluation of results of internal, organizational processes of new product development – before market launch.

We argue that, in a business context, it is important to also consider the value of the creative outcome; value could presumably be included in the evaluation of usefulness, but George suggests addressing the question of "*useful for whom*" (George, 2007: 443), because within the *useful* dimension more stakeholders can be identified, namely the organization and the recipients of the creative outcome. We therefore suggest that useful relates primarily to the recipients of the creative outcome and introduce *market potential* as a value evaluation criterion of COE. In this case what the creative outcome is expected to bring to the organization. An idea or a product can be both new and useful to the intended recipients, but will not necessarily create value and encompass a great economic potential to the organization if, for instance, the product is considered too expensive to produce or the market too small to focus on. Adding market potential as a dimension alongside novelty and usefulness will enable a clearer understanding and evaluation of COE; additionally, the three dimensions can relate to indicators of innovation performance, taking into account the *point of innovation*, be it the probability of successful commercialization (Schumpeter, 1934) or at a later stage when recipients have both obtained and truly adopted a new release (Denning and Dunham, 2010).

Bearing in mind the potential link between creative actions and outcome effectiveness, and the importance of a clear distinction between multiple dimensions of CPBs and COE, the next paragraphs conceptually identify and empirically indicate the reciprocal relationship between creative performance of heterogeneous groups, and the motivation and creativity of individual group members.

LINKING THE INDIVIDUAL WITH THE GROUP LEVEL

In recent years, scholars have emphasized the need for a systems view of creativity (Hennessey and Amabile, 2010) or at least a heightened awareness of 1) the level(s) in focus, i.e., individual, group, organization, or culture, 2) the facet(s) to be analyzed, i.e., trait (person), process, environmental influence, or product, and 3) the measurement approach, i.e., objective, self-, or other-ratings (Batey, 2012). The investigations presented in this paper are located at individual and group level, and facets of person, process, and product are included through self-, and other-ratings.

Individual and group level creativity have been examined simultaneously (e.g., Taggar, 2002; Kurtzberg, 2005), and when combining individual and group level studies it seemingly becomes complicated to clearly define creativity at either level, as group patterns and interactions likely change individual members' states and perceptions (Kurtzberg, 2005). Thus, during a process of new product development in groups, several factors potentially influence creative behavior and performance.

Individual creativity and motivation

Amabile's (1988) componential theory suggests that the level of individual (and group) creativity is relative to the mixture of individual's creative-thinking skills, domain-relevant skills, and task motivation.

Creative-thinking skills "*determine how flexibly and imaginatively people approach problems*" (Amabile, 1998: 78). Creative thinking can be equated with divergent thinking or seen as rapid, reciprocal actions of 1) imaginative or divergent thinking, i.e., cognitive activity where ideas are allowed to enter the mind without judgment of the quality or usefulness of these, and 2) reasoning or convergent thinking which includes attention to demands of the external world. In either case, creative thinking can be seen as imagination anchored in reality, as "*Creative people ... are original without being bizarre. The novelty they see is rooted in reality*" (Csikszentmihalyi (1996: 63). This is on par with George's (2007) overall recommendations for considering the internal processes of creativity in a dialectical fashion.

Nothing comes from nothing, since an individual who is imagining something will unconsciously draw upon a collection of references stored in the memory. Domain-relevant skills refer to the expertise of an individual and can be seen as the points of reference that will help the individual decide which direction to take when working on a specific task. According to Koestler (1964) creativity can be defined as the interlocking of two previously unrelated skills or matrices of thought, which explains why expertise is highly relevant also to group creativity where analogical reasoning, i.e. the act of applying a concept or an idea from a particular domain to another domain, can lead a group to think about different, nontraditional ideas (Thompson, 2003).

The two skill-components determine what an individual is capable of doing, i.e. *can do*, whilst the third component, task motivation, determines what the individual *will do*. The creative behavior of an individual can be extrinsically or intrinsically motivated (Amabile, 1988), and these external or internal drivers for engagement can lead to either expected or unexpected creativity as stated by, a.o., Montag et al. (2012) and Unsworth (2001). The latter used this distinction together with open or closed problem type to suggest a finer-grained matrix of creativity types including *responsive*, *expected*, *contributory*, and *proactive* creativity which, as the choice of words reveals, ranges from those who are creative only on request to those who will unexpectedly share and explore creative thoughts and ideas.

All three components of individual creativity can be juxtaposed to the dimensions of Montag et al.'s (2012) CPBs, as creative-thinking skills are particularly important to idea generation, domain-relevant skills are particularly important to the phases of preparation/information gathering and idea evaluation, and intrinsic task motivation is particularly important to problem formulation and idea generation (Amabile, 1988). With this comparison in mind, we suggest that individual members' motivation to use different skills – including domain-relevant expertise and the ability to think creatively – when engaging in tasks of new product development, is termed *individual creative performance behaviors* (individual CPBs).

Group performance and group creativity

Even though group creativity could easily be included as one of many parameters of group performance, a distinction between group performance and group creativity will be made for the sake of clarity on the topic of this paper; thus, group performance refers to the *overall*

performance of a group, and group creativity refers specifically to the *creative performance and behaviors* of a group. Accordingly, we define group creativity as the combination of individuals' creative behaviors and contributions to a group and its project work. As such, because a group consists of individual members, and each member's creative behaviors contribute to the group's creative performance, we suggest to use the term *group creative performance behaviors* (group CPBs) when referring to the sum of individuals' behaviors comprising group creativity. Thus, when looking at individual level creativity, it will, as stated in the last paragraph, be referred to as individual CPBs, and when looking at group level creativity, it will be referred to as group CPBs. If individual CPBs lay the ground to group CPBs it would mean that

Hypothesis 1: Individual CPBs positively relate to group CPBs.

Next, when looking at individual member characteristics relevant to overall group performance it would be appropriate to emphasize what is unstated in 'group' and 'team', respectively. In the extant literature, both terms are used to describe two or more people working together – at least to some extent. A work group may simply share office space, information, etc., whereas a team is characterized by high task interdependence, high role differentiation, high task differentiation, and distributed expertise (Neuman and Wright, 1999). High-performance teams, i.e. groups that perform at a high level, are characterized by strong personal commitment to one another's growth and success, a deep sense of purpose, ambitious performance goals, complete approaches, full mutual accountability, and interchangeable as well as complementary skills (Katzenbach and Smith, 1993). Thus, what will make a group perform well, and maybe become a high-performance team, is the appropriate balancing of skills, accountability, and commitment to the group as a whole and its individual members.

Since the components leading a group to high performance are in some ways equivalent to those of individual creativity (skills and commitment/motivation), it seems likely that individual – and group – CPBs could be linked to how members assess group performance, which leads to

Hypothesis 2: Individual CPBs positively relate to the level of perceived group performance.

Hypothesis 3: Group CPBs positively relate to the level of perceived group performance.

The composition of a group, along with individual members' mutual agreements, should depend on the type of tasks they have been given. Diversity among group members has been investigated by, e.g., Milliken et al. (2003) who distinguish between detectable and undetectable diversities among group members: i.a. race, gender, age, and ethnic background would be readily detectable, whereas expertise, cognitive styles, values and background, personality aspects, etc., would not be readily detectable. Both detectable and undetectable diversities may affect creativity in a group, because variations increase the likelihood of different approaches and thereby both inspiration and dissent. Thus, it would be expected that diversity among group members increases the probability of highly creative contributions compared to those of homogeneous groups or to individuals creating alone, because members let themselves open to influence by others with different expertise, values and approaches. In general, results from research on heterogeneous versus homogeneous groups point to diversity as an enabler of a variety of perspectives and approaches brought to a problem, but also as the creator of social divisions with a negative impact on group performance. Mannix and Neale (2005) reviewed 50 years of research on diversity and found that negative effects tend to be more likely with diversity of race/ethnicity, gender, or age, and that less readily detectable differences such as expertise or personality are more often positively related to performance. Nijstad and Paulus (2003: 328) state that "*if it were not for diversity there would be no point in creative collaboration*". Hence, diversity seems to be the starting point for collaborative creative actions for which reason

we assume that groups may benefit from expertise diversity (i.e. not readily detectable, although may be implicitly known through experience):

Hypothesis 4: Recognition of the importance of expertise diversity positively relates to the level of perceived group performance.

Linking individual creativity with group performance and group creativity

Thus, on the road to disentangling links between individual creativity and group creativity and performance it would be relevant to 1) compare evaluations of individual and group level creativity with indicators of high-performance, and 2) simultaneously investigate the impact of individual skills and motivation for contributing to the group work, and also 3) how these parameters are influenced by diversity among group members.

By letting individual members subjectively evaluate their own, other group members', and the group's unified creativity it is assumed that it will be possible to focus on motivation, skills, and diversity alongside the phases of problem formulation, preparation/ information gathering, idea generation, and idea evaluation, and also expected versus unexpected creativity at both individual and group level. Additionally, by letting individual members rate their own and the way they perceive other group members' general approach to the group and its work, it should be possible to outline perceived performance, again at both individual and group level. In order to be able to evaluate the condition and progress of a group, the different dimensions should be investigated more times during the process of new product development.

Interestingly, Kurtzberg (2005) found that *cognitive* diversity among group members may be beneficial for the objective functioning of the group but may damage group satisfaction, affect, and individual members' impressions of their creative performance. She also found that individual members' ratings of their own and their group's creativity did not relate to the level of group performance rated by judges. The empirical evidence consisted of individual group members' subjective perceptions of their own and their group's creativity – which is also one of the goals of the research for the present paper – and was supplemented with objective measurements of group performance on the basis of fluency, i.e. the quantity of relevant ideas (part of Guilford's (1961) recommendations for the measurement of individual creativity). The research of Kurtzberg does not specifically qualify or separate dimensions of COE, i.e., novelty, usefulness, and market potential of the ideas.

In order to obtain a nuanced evaluation of COE, it is expected that experts should rank a group's work by focusing on the three dimensions of COE separately and, at the same time, group members could evaluate their individual learning outcome of the same dimensions plus what they learned about collaboration in heterogeneous groups and whether and how the diversity has affected their own skills. The evaluations should enable the disentangling of links between creative processes and outcome of new product development by making an interesting comparison between different dimensions:

Hypothesis 5: The level of perceived group performance positively relates to COE.

Hypothesis 6: Recognition of the importance of expertise diversity positively relates to COE.

Hypothesis 7: Group CPBs positively relate to COE.

Hypothesis 8: Individual CPBs positively relate to COE.

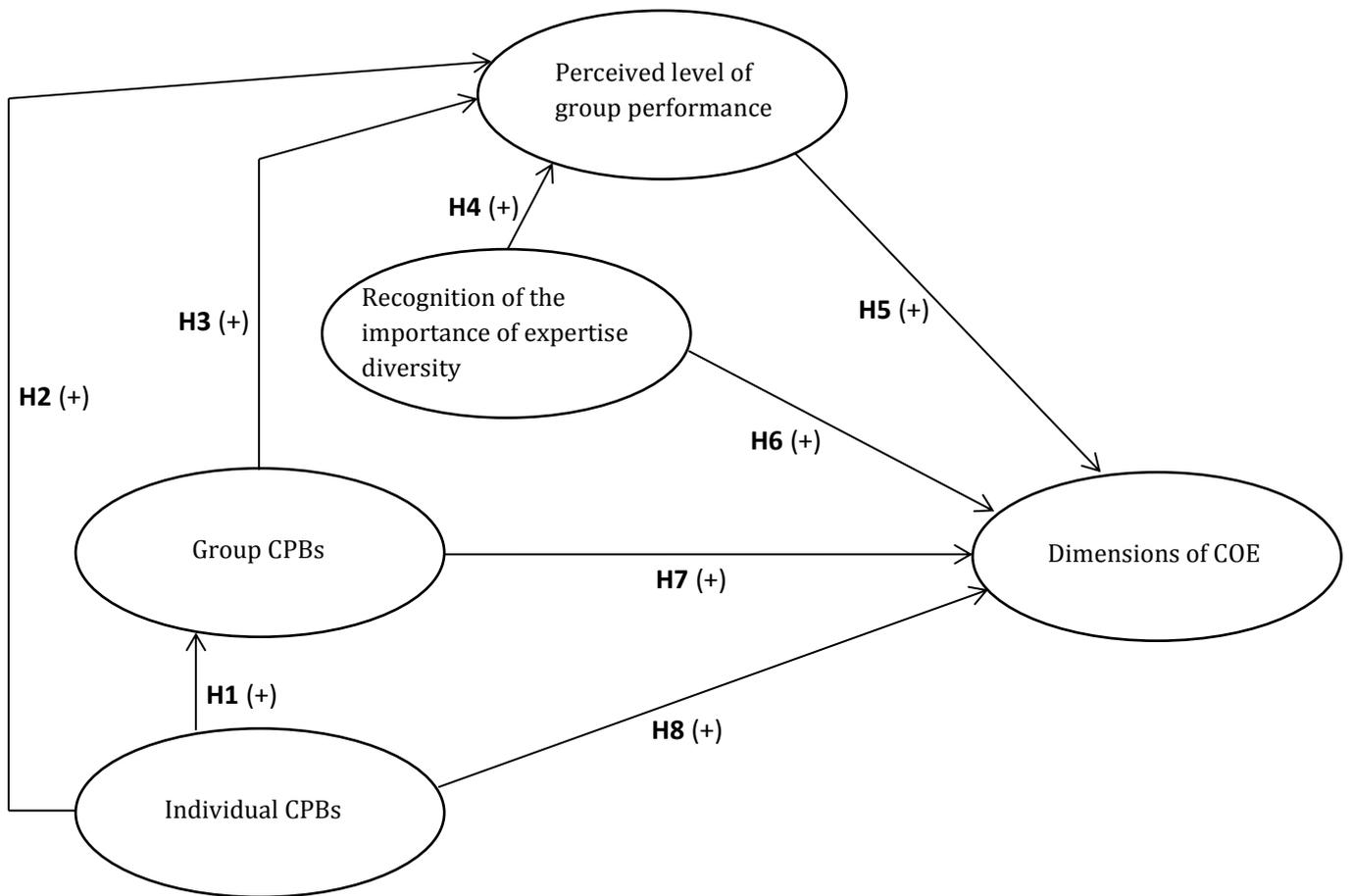


Figure 2: Initial hypothesis model

DATA AND VARIABLES

Population and the survey

The collection of quantitative data for the paper started October 2012 and ends January 2013. The population consists of 213 5th semester students from 14 different engineering study programs meeting minimum twice a week to work together on new product development and entrepreneurship. To encourage cross-disciplinarity, the students have been grouped into “businesses” with an average group size of 6 members.

The aim of the student project work is to develop new engineering solutions and to investigate the potential market hereof, thereby emphasizing issues of product development, innovation, marketing, project management, and team work. Some groups work on themes that are given and defined by real companies, some are more open. The set-up is designed to resemble real-life situations of how companies approach new product development, where group members are selected on the basis of an appropriate combination of skills, they work on tasks together and alone, their ethnic backgrounds may differ, both genders might be represented, etc. Hence, the empirical setting with a population of students is quite controlled and allows for some ideas of how, among other things, individual CPBs are related to group CPBs and, ultimately, to creative outcome, and also for some general considerations and implications.

By means of a questionnaire, the survey focuses on both self- and other-ratings of the various dimensions, and, after the project period, experts will assess creative outcomes of the work of the groups. Furthermore, the research team has access to project evaluations, personal profile scores, and collaboration measures.

At this writing, phase one of the survey has been completed, and after three email reminders a questionnaire was filled in by 44% of the population, 94 respondents from 34 different groups. The average age of respondents is 24 years, 21 nationalities represented from 11 different lines

of study. COE, i.e., the novelty, usefulness, and market potential of the product of the project work, will be judged by the groups' supervisors and an external censor, who are all considered stakeholders, yet objective.

Dependent variable - COE

The dependent variable is the creative outcome effectiveness, COE, of the final product solution, and will be assessed when the two supervisors and the external censor independently distribute a total of 100% to the three dimensions, i.e., novelty, usefulness, and market potential, and also rank the level of each dimension on semantic scales.

The individual learning outcomes of working with the dimension of COE are established by asking the students to state the importance of and the degree to which they have increased their understanding and knowledge of innovation (novelty), target customers (usefulness), and business aspects (market potential), collaboration, and whether they have improved their expert skills by working together with people of diverse backgrounds.

The combination of expert ratings of COE and students' self-ratings of learning outcomes of the same dimensions, plus collaboration and diversity, makes an interesting linking possible.

Independent variables – CPBs and more

The independent variables reflect self- and other-ratings of CPBs, viz. 1) individual members' perception of their own and their group's creative behaviors in the phases of problem formulation, preparation/information gathering, idea generation, and idea evaluation, 2) individual members' perception of their own and their group members' type of creative behavior, and also 3) individual members' motivation towards and approach to creative activities, 4) individual members' perception of their own and their group member's skills, commitment, and accountability, i.e. the components of a high-performance team, 5) individual members' attitude towards and assessment of the impact of the diversity of group members, and, e.g., 6) selected detectable and undetectable diversities among group members.

Perceptions of individual and group creative behaviors in four phases

The students were asked to use a 7-point Likert scale ranging from 'not at all' (1) to 'to a great extent' (7) to state their approach to the project work, i.e., how they perceived their own creative behaviors. The concurrent categorization of the questions serve to clearly mark how creative behaviors unfold in the four phases relevant to CPBs: "I suggest ways to achieve goals or objectives" is linked to the phase of problem formulation. "I search out new technologies, processes, techniques, and/or product ideas" and "I suggest new ways of performing work tasks" are linked to the phase of preparation/information gathering. "I come up with new and practical ideas to improve the process and/or the product", "I suggest new ways to increase quality of the process and/or the product", "I am a good source of creative ideas", "I am not afraid to take risks", "I often have a fresh approach to problems", and "I build on the team's ideas by offering solutions" (almost as Taggar, 2002) are linked to the phase of idea generation. "I develop adequate plans and schedules for the advancement of the project" and "I summarize and organize the team's ideas" (almost as Taggar, 2002) are linked to the phase of idea evaluation. All questions are the same as or almost like those of George and Zhou (2001), except the two marked as Taggar's (2002).

Additionally, to find out which tasks the students had mainly focused on, they were asked to distribute a total of 100% to the four phases, indicating how much time their team had spent on each of these.

To state how the students perceived their group's approach to the project work, i.e., how the individual member perceived the group's creative behaviors, a 7-point semantic scale was used: "My team members use mainly well-known procedures when working on the project" (1)/"My team members seek mainly new ways of doing things when working on the project" (7) (last question almost as Gilson and Shalley, 2004), "My team members exchange information, but, primarily, do

the work alone" (1)/"My team members exchange information and, primarily, work on tasks together" (7), and "My team members generate ideas on their own" (1)/"My team members link ideas that originate from multiple team members" (7) (last question almost as Gilson and Shalley, 2004).

Expected versus unexpected creativity

In order to find out how individual members assessed each of their group members' approach to problem solving, i.e., how the students perceived their own and their group members' type of creative behavior (whether it would be responsive, expected, contributory, or proactive according to the matrix of Unsworth (2001)), the students were asked to tick off one of four options per group member: "This member suggests solutions to specified and agreed upon problems, but only on request from others", which would relate to responsive creativity, "This member suggests solutions to open problems, because it is (a necessary) part of the project work", which would relate to expected creativity, "This member engages in solving specified and agreed upon problems, also if these are not directly within own field of work or expertise", which would relate to contributory creativity, and "This member actively and voluntarily searches for problems to solve, and makes unprompted proposals for project progress", which would relate to proactive creativity.

Expected versus unexpected creativity in the group as a whole were assessed using the following questions on a 7-point semantic scale: "My team members use new approaches when working on the project – but only when it is required" (1)/"My team members search for new approaches when working on the project – even if it is not required at the time" (7). The last question is inspired by George and Zhou (2001) and Gilson and Shalley (2004).

Individual motivation

Individual members overall attitude towards creativity and project work were assessed on a 7-point Likert scale ranging from 'not at all' (1) to 'to a great extent' (7) with the following questions: "The project is relevant to my education as a whole", "Creativity and creative activities are important to my education as a whole", and "Creativity and creative activities are important to my project".

Their motivation towards and way of approaching the project work were assessed with questions on a 7-point semantic scale, "I prefer to generate ideas on my own" (1)/"I prefer to generate ideas together with the other team members" (7), "I feel most creative working on my own" (1)/"I feel most creative working with the other team members" (7), and "I am frustrated with my team" (1)/"I feel satisfied with my team" (7). The last two questions are like those of Kurtzberg (2005). Additionally, a couple of questions on a 7-point Likert scale ranging from 'not at all' (1) to 'to a great extent' (7) were asked: "I feel challenged by the work I am currently doing" (like Amabile et al., 1996), "I promote my ideas to the team" (almost as George and Zhou, 2004), "I enjoy the work", and "My team works well together". The last two questions are almost like those of Kurtzberg (2005).

Indicators of performance level

The questions to unfold individual members' perception of their own and their group's skills, commitment, and accountability focus on both individual and group level. All questions are assessed on 7-point Likert scales ranging from 'not at all' (1) to 'to a great extent' (7).

At the individual level the questions are: "Especially my own background and experiences allow me to perform well in this project", "In this project, I focus on working alone", "I feel committed to my individual tasks in this project", "I show responsibility towards my individual tasks in this project", "I focus on my individual goals in this project", "I am preoccupied with my professional development in this project", "I am preoccupied with my personal development in this project", and "I am preoccupied with my individual success in this project".

The questions concerning the individual member's approach to the group are: *"I feel committed to my team", "I show responsibility towards my team", "I focus on common goals in this project", "I am preoccupied with my team members' professional development in this project", "I am preoccupied with my team members' personal development in this project", and "I am preoccupied with my team members' individual success in this project"*.

The individual member's perception of the other group members contributions, including their skills, commitment, and accountability, is assessed using the following questions: *"The combination of the team members' educational backgrounds allow us to perform our best", "The team members work towards individual goals in this project", "The team members show commitment towards their individual tasks in this project", "The team members show commitment towards the team work in this project", "The team members demonstrate responsibility towards the team work in this project", "The team members focus primarily on working together in this project", "The team members work towards common goals in this project", "The team members are preoccupied with each other's professional development in this project", "The team members are preoccupied with each other's personal development in this project", and "The team members are preoccupied with each other's success in this project"*.

Additionally, the students were asked to rate how well they thought their team performed, i.e. how they perceived their team's overall performance relative to peer groups: *"My team's overall performance is good compared to other teams that I know of"*, and also their team's creative performance: *"From the first project meeting until now my team performed creatively"*.

Diversity

Bearing in mind that the main purpose of their project was to build experience working together with people of different educational backgrounds, the students were asked to indicate how they experienced the impact and importance of these differences on a 7-point Likert scale ranging from 'not at all' (1) to 'to a great extent' (7): *"The fact that the composition of my team was decided by the supervisors seems to influence the team with regard to its overall performance", "The members' educational differences seem to influence the team with regard to creativity", and "The members' educational differences seem to be important to the team with regard to creativity"*.

Various undetectable diversities were uncovered by asking each student to state nationality, age, line of study, qualifying exam prior to their present study, and any other relevant educational background. Apart from this, the research team has access to gender and a Belbin team role profile of each student.

DATA ANALYSIS

As the survey period is not yet completed, only descriptive statistics are offered so far indicating some potentially interesting results.

Methods

Hitt et al. (2007) suggest that when data collected at one level of analysis are related to constructs at another level of analysis, descriptive statistics can be used to represent the processes that associate, in this case, individual with group level. Using individual members' answers to measure group-level phenomena require compatibility. The survey has, to a great extent, been organized so that the respondents assess both themselves and their groups – and in a few cases even every member of the group – on comparable dimensions. Group performance, i.e., is measured through questions establishing individual members' perception of their own and their group's unified skills, commitment, and accountability, and thereby should make it possible to link the individual with the group level.

Correlations between the dimensions in the hypothesis model will be conducted fully once the survey, including ratings of COE, has been completed. This assessment will enable a comparison of the ratings from the three respondents with those of the individual group members.

Preliminary findings

The work of reducing the data to a manageable set of factors has begun. Through a principal component analysis, some of the variables concerning individual CPBs have been reduced by factor extraction and subsequent rotation.

Three 7-point Likert-scale questions (table 1) concerning relevance of the project and importance of creativity showed high reliability with an overall Cronbach’s α of 0.795. Interestingly, the means of all variables are above average, thus the group members could be expected to be highly motivated to engage creatively in the project work.

	N	Min.	Max.	Mean	S.d.
The project is relevant to my education as a whole	95	1	7	4.24	1.866
Creativity and creative activities are important to my education as a whole	95	1	7	4.95	1.789
Creativity and creative activities are important to my project	95	1	7	4.81	1.532

Table 1: Descriptive statistics for individual CPBs, the relevance of the project and the importance of creativity.

The members appear to be quite motivated to work creatively together with the other group members (table 2). The two questions concerning working creatively alone or together, arranged as 7-point semantic scales, showed high reliability with an overall Cronbach’s α of 0.733.

	N	Min.	Max.	Mean	S.d.
I prefer to generate ideas on my own (1)/ I prefer to generate ideas together with the other team members (7)	87	1	7	4.84	1.784
I feel most creative working on my own (1)/ I feel most creative working with the other team members (7)	87	1	7	4.49	1.758

Table 2: Descriptive statistics for individual CPBs, working creatively alone or together.

When it comes to satisfaction with the team (table 3), the mean is also above average, indicating rather satisfied students concerning their actual team work.

	N	Min.	Max.	Mean	S.d.
I am frustrated with my team (1) / I feel satisfied with my team (7)	87	1	7	4.86	1.556

Table 3: Descriptive statistics for individual CPBs, satisfaction with the team.

All in all tables 1-3 show that the members acknowledge the importance of working creatively as a group and that they are satisfied with doing the project. With regard to their individual

learning from the project work, the mean is just below average on the variable concerning the improvement of their creative-thinking skills (table 4). So, even though the group members seem motivated to behave creatively, they do not seem to have really benefitted from this.

	N	Min.	Max.	Mean	S.d.
I have improved my creative-thinking skills, e.g. when the team uses ideation techniques	86	1	7	3.37	1.652

Table 4: Descriptive statistics for individual CPBs, improvement of creative-thinking skills.

In addition, some of the variables concerning group CPBs have been reduced and clustered. Two questions, arranged as 7-point semantic scales that were developed based on Unsworth's (2001) theory of expected versus unexpected creativity and creativity types, showed high reliability with an overall Cronbach's α of 0.745 (table 5). When working as a group, the members apparently take the easy way out by approaching work tasks in somewhat habitual ways. This is not on par with them having an, above average, eye for the relevance and importance of engaging in the project, creatively (as shown in table 1). Expectedly, the results of table 5 would have indicated stronger motivation for the groups to seek new ways of doing things.

	N	Min.	Max.	Mean	S.d.
My team members use mainly well-known procedures when working on the project (1)/ My team members seek mainly new ways of doing things when working on the project (7)	93	1	7	3.41	1.345
My team members use new approaches when working on the project - but only when it is required (1)/ My team members search for new approaches when working on the project - even if it is not required at the time (7)	93	1	6	3.32	1.105

Table 5: Descriptive statistics for group CPBs, expected versus unexpected creativity.

Table 2 showed individual members' preferred approach to idea generation with a mean of 4.67, whereas table 6 below shows how they perceive group CPBs on the same dimension. The mean is approximately equal at individual and group level. Thus, it appears that in general group members prefer generating ideas together.

	N	Min.	Max.	Mean	S.d.
My team members generate ideas on their own (1)/ My team members link ideas that originate from multiple team members (7)	93	1	7	4.63	1.435

Table 6: Descriptive statistics for group CPBs, generating ideas alone or together.

With a correlation coefficient of 0.245, table 7 shows that individual CPBs are significantly related to group CPBs (variables 2 and 3) when it comes to idea generation. Therefore, Hypothesis 1 is supported.

						1	2	3	
						I prefer to generate ideas on my own (1)/ I prefer to generate ideas together with the other team members (7)	I feel most creative working on my own (1)/ I feel most creative working with the other team members (7)	From the first project meeting until now, my team performed creatively	
	N	Min.	Max.	Mean	S.d.				
1	87	1	7	4.84	1.784	I prefer to generate ideas on my own (1)/ I prefer to generate ideas together with the other team members (7)	Pearson Sig. (2-tailed) N	.578*** .000 87	.076 .485 87
2	87	1	7	4.49	1.758	I feel most creative working on my own (1)/ I feel most creative working with the other team members	Pearson Sig. (2-tailed) N	.578*** .000 87	.245** .022 87
3	93	1	7	4.63	1.435	My team members generate ideas on their own (1)/ My team members link ideas that originate from multiple team members (7)	Pearson Sig. (2-tailed) N	.076 .485 87	.245** .022 87

* Correlation is significant at the 0.1 level (2-tailed)
 ** Correlation is significant at the 0.05 level (2-tailed)
 *** Correlation is significant at the 0.01 level (2-tailed)

Table 7: Correlation of individual CPBs and group CPBs with regard to idea generation.

Descriptive statistics for creative group performance (table 8) show that members rate their own group to be more creative than other project groups, i.e. all groups perform creatively above average compared to peer groups! This rating can also be interpreted as a possible creativity motivator, but again it seems to be in conflict with the members' ratings of how their group approaches tasks (table 5) in somewhat habitual ways.

	N	Min.	Max.	Mean	S.d.
From the first project meeting until now, my team performed creatively	91	1	7	4.34	1.343

Table 8: Descriptive statistics for group CPBs, creative group performance.

The members were asked to indicate how much time they have spent in each of the four phases related to CPBs (table 9). Idea generation stands out, and since both creative-thinking skills and intrinsic task motivation (Amabile, 1988) are particularly important to this phase, it may be relevant to, i.a., juxtapose this with the members' ratings of their own creativity (descriptive statistics not ready yet).

	N	Mean %	S.d. %
Problem identification/definition	93	22.6	12.240
Preparation/information search	93	24.32	13.604
Idea generation	93	31.29	16.250
Idea evaluation/selection	93	21.77	10.099

Table 9: Descriptive statistics for group CPBs, the time spent in each of the four phases related to CPBs.

Data will follow on the variables in table 10 concerning the perceived level of overall performance (questions arranged as 7-point Likert-scales).

Especially my own background and experiences allow me to perform well	The combination of the team members' educational backgrounds allow us to perform our best
In this project, I focus on working alone	The team members focus primarily on working together
I feel committed to my individual tasks in this project	The team members show commitment towards their individual tasks
I show responsibility towards my individual tasks in this project	
I focus on my individual goals in this project	The team members work towards individual goals
I am preoccupied with my professional development in this project	
I am preoccupied with my personal development in this project	
I am preoccupied with my individual success in this project	
I feel committed to my team	The team members show commitment towards the team work
I show responsibility towards my team	The team members demonstrate responsibility towards the team work
I focus on common goals in this project	The team members work towards common goals
I am preoccupied with my team members' professional development	The team members are preoccupied with each other's professional development
I am preoccupied with my team members' personal development	The team members are preoccupied with each other's personal development
I am preoccupied with my team members' success	The team members are preoccupied with each other's success

Table 10: Variables concerning overall performance.

The variables in table 10 were developed based on the theory of high-performance teams (Katzenbach and Smith, 1993), where the combination of skills and the levels of commitment and accountability will decide how well a group performs. According to the theory, the difference between a well-performing group and a high-performance team is the group members' preoccupation with each other's development and success.

The last three variables at each side of table 10 would be directly comparable, even though the left hand side shows the results of the members' ratings of their own preoccupation with their group members, and the right hand side shows the results of the members' ratings of their group members' preoccupation with each other in general. The means of the variables would have to be distinct to indicate high-performance.

Other variables of table 10 could also be compared, i.a. those concerning responsibility (an indicator of accountability), commitment and the focus on common goals.

DISCUSSION AND FUTURE RESEARCH DIRECTIONS

In the literature, creativity is often measured in educational settings, but also quite often in business organizations. As Mannix and Neale (2005) suggest, heterogeneous group with a learning mission may have very different outcome prospects than heterogeneous group with a short-term, goal-directed project in real life settings. The empirical evidence from a population of students may therefore not be applicable to what is going on in business organizations working with new product development. However, some important parallels can be drawn between the present study and real life settings: 1) the members were pre-distributed (by their supervisors) to their groups on the basis of complementarity (both by personal profile and by education), which is very often also the case in an organization with the objectives of being able to handle the complexity of a task and benefit from employees different skills and backgrounds, 2) the group members can be seen as part of a matrix organization where they, during some months, work alternately together and alone on the project while handling other projects and tasks concurrently, and 3) the groups are composed of members of different nationalities, which is mainly similar to internationally oriented organizations. Altogether, the group compositions resemble real life settings.

During their project, the students focus on all three dimensions of COE, i.e. novelty of the product they come up with, the degree to which it is useful to target customers, and also the market potential of the product which is assessed as part of a business plan. However, the students do not solely focus on these product oriented outcome dimensions of the project – learning is also a big part of the picture and the efforts of the students will be assessed when they sit for their exam. It could be argued that employees in an organization would also be preoccupied with their learning, but it may likely be a more unconscious part of their everyday work life than what is the case for students who receive ongoing evaluations from their teachers. Nonetheless, the risk of sub-optimization when students are mainly preoccupied with improving their own skills or grades would resemble that of employees trying to get noticed for their individual efforts in order to achieve appraisal and maybe a higher salary, or focusing on their own professional development with a preference for the tasks that they find interesting or career promoting.

MANAGERIAL IMPLICATIONS

Await further data analysis, but it could be expected that employees' individual motivation to perform creatively in, heterogeneous, groups within business organizations would be as significant or even more significant as that of students, although depending on the organization's goals and statements concerning innovation.

KEYWORDS: creativity, diversity, motivation, performance, innovation, product development.

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