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## **Pursuing Benefits of Diversity: What Leads to Creative Performance with Innovation Potential?**

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### **Abstract**

This paper addresses how non-visible differences, especially expertise and team role diversity among members, impact creative performance of a group, and stresses the importance of measuring the creative outcome of new product development on separate dimensions in order to identify novelty, usefulness, and market potential of a product proposal and thereby its innovation potential. Preliminary empirical results do not paint a clear picture of the links between diversity and creative performance, but point to the need for defining and measuring the latter as a multi-dimensional construct, as well as to future research on diversity and team role theory in relation to creative performance.

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This paper addresses how non-visible differences, especially expertise and team role diversity among members, impact creative performance of a group, and stresses the importance of measuring the creative outcome of new product development on separate dimensions in order to identify novelty, usefulness, and market potential of a product proposal and thereby its innovation potential. Preliminary empirical results do not paint a clear picture of the links between diversity and creative performance, but point to the need for defining and measuring the latter as a multi-dimensional construct, as well as to future research on diversity and team role theory in relation to creative performance.

**Key words:** group diversity, creativity, innovation, team roles, diversity management.

## CONSIDER THE GROUP

When organizations fail to develop, they will phase-out. Hence, in order to stay in business, innovation is needed which comprises significant expenditures and focus on e.g. new product development. To create and exploit a new product idea fully, i.e. gain sufficient and lasting market shares, take creativity, intelligence, drive, reflectiveness, decisiveness, yet caution, etc., and no single employee can be expected to possess all these characteristics in sufficient quantity or quality. On the other hand, a group of employees with both complementary skills (Mannix and Neale, 2005) and counterbalanced behavioral characteristics (Prichard and Stanton, 1999) may come a long way.

Thus, innovation management and the planning of new product development should include the acknowledgement of the potentials inherent in a suitable group composition. But what criteria form the basis of a high performing group? Organizations can use educational and functional background, age, gender, seniority, etc., as straightforward criteria for composing heterogeneous groups, and also more behavior-related criteria may be relevant to project outcome, such as the representation and balancing of members' preferred team roles (Belbin, 2005); moreover, the tendency towards globalization entails cultural and linguistic heterogeneity of organizational working groups. However, a recent study shows that diversity management is not an integrated part of business areas such as product development and marketing but primarily a concern of the human resource department, in order to comply with legal issues, and mainly considered in recruitment processes (Lettice and Özbilgin, 2012).

Katzenbach and Smith (1993a) distinguish between groups with the objectives of *recommending* (e.g., audit, quality, or safety) or *running* things (e.g., ongoing programs) and those which *make or do* things (e.g., development, operations, marketing, or sales), and goals and purposes of these kinds of groups may differ. Lettice and Özbilgin (2012) point out how organizations rarely think of diversity management in relation to creativity and innovation which emphasizes a potential need for it in order to exploit benefits and avoid pitfalls of diversity in connection with new product development. To further highlight the need for diversity management, the focus of this paper is therefore to conceptualize the impact of diversity in connection with new product development, where creative and innovative contributions are the center of attention with regard to a group's performance, i.e. its *creative* performance. More specifically, the paper presents a conceptualization of how heterogeneity of members impacts a group's creative performance, and also preliminary empirical results indicating interesting links with relevance to management.

## Diversity: a double-edged sword

In pursuit of exploiting assumed benefits of diversity, organizations can compose groups to ensure complementarity of skills based on members' educational backgrounds and experience; e.g., age and nationality may also be taken into account, depending on the task objectives. Interestingly, fifty years of research on diversity has shown mixed results (Mannix and Neale, 2005), namely that non-visible diversity of expertise or personality is more often positively related to group performance, whereas with more visible heterogeneity of race, ethnicity, gender, or age negative effects tend to be more salient. If members stay and work together, and thus grow accustomed to each other, these negative effects of heterogeneity tend to diminish over time, though (Watson et al., 1993). These are findings from research on a group's *overall* performance, which can be measured on team effectiveness in terms of quantity and quality of the outcome of the group's work, or team performance in terms of e.g. cohesion among group members; the right combination and level of team effectiveness and team performance enable a group to become a high performing team (Katzenbach and Smith, 1993b).

With regard to a group's *creative* performance, Milliken et al. (2003) state that both visible and non-visible diversity increase the likelihood of different approaches, which may enhance inspiration and divergent thinking but also dissent and potential conflicts within the group. Inspired by e.g. Milliken et al. (2003), *Table 1* outlines definitions of what is readily versus less readily detectable:

Readily detectable	Less readily detectable	
<b>Visible</b>	<b>Easy to uncover</b>	<b>Non-visible</b>
<b>Age</b> (estimation) <b>Gender</b> <b>Race</b> <b>Ethnic background</b> (attire may reveal it) <b>Other physical characteristics</b> (e.g., voice, gesticulation, body language)	<b>Nationality</b> (language may reveal it) <b>Educational background</b> <b>Functional background</b> (work experience)	<b>Knowledge base</b> <b>Experience</b> <b>Cognitive styles</b> (imagination, approach to problem solving, etc.) <b>Values</b> (based on cultural, religious, and socio-economic background) <b>Personality profile</b> (e.g. introvert versus extrovert)

*Table 1: An overview inspired by definitions of what is readily or not-readily detectable made by e.g. Milliken et al. (2003).*

According to Kurtzberg (2005), the actual birth-year or the color of members' skin less likely influence a group's creative performance, whereas expertise and cognitive styles that members employ are the most important differences with regard to creative performance.

*Cognitive*, non-visible, diversity among group members appears to entail mixed effects: being a member of a cognitively homogeneous group leads to positive feelings and perceptions of increased performance, whereas in heterogeneous groups cognitive diversity has a negative effect on satisfaction with the group, members' impressions of their creative performance, and also affect, but leads to a greater number of ideas (Kurtzberg, 2005). However, similar to findings regarding overall group performance, the negative effects of diversity are reduced over time (Milliken et al., 2003).

*Expertise* diversity – another less readily detectable difference – is not only highly needed for developing today's complex technological products but also tend to have a positive effect on a group's creative performance (Amabile, 1997). According to Hargadon and Bechky (2006: 489) "collective creativity has occurred when social interactions between individuals trigger new interpretations and new discoveries of distant analogies that the individuals involved, thinking alone, could not have generated". Expertise encompasses members' knowledge, experience, and skills from e.g. functional background for which reason the diversity of members' expertise may bring multiple perspectives and solutions to problems. As an example, a study by Bantel and Jackson (1989) shows that top

management groups of more innovative banks consist of more educated members who are more diverse with respect to functional background.

To exploit potential positive effects of expertise and cognitive differences, managers should see to it that groups are “constituted of diversely skilled individuals with a shared intrinsic motivation for their work and a willingness to both share and constructively criticize each other’s ideas” (Amabile, 1997: 55).

This leads to the following proposition:

**P1:** *Expertise diversity positively relates to a group’s creative performance.*

Although expertise diversity in relation to creative performance has already received the attention of scholars in the field, the findings and definitions above indicate that certain member characteristics and behaviors are important to zoom in on, namely whether or not members value expertise diversity, are intrinsically motivated to being creative in a group, and constructively contribute to e.g. idea generation.

### **Defining creative performance**

Creative performance of a group is defined as the outcome of the group’s creative processes, i.e. its production of ideas (Amabile, 1988). Previous research has shed light on the links between various kinds of diversity and creative performance of both heterogeneous and homogeneous groups (e.g. Kurtzberg, 2005), and the quantity of ideas, i.e. fluency (Guilford, 1950), is a widely acknowledged way of determining a group’s creativity. However, results from research on prosperous, heterogeneous groups (Belbin, 2005) that seem to end up performing well by generating and sticking to only a few good ideas throughout the process, may imply that fluency simply indicates which group members are capable of producing a large number of ideas within a certain time frame – and it may enhance their chances of having significant ideas – but as such fluency is not a measure of a group’s creative performance with innovation potential; a group may be able to generate lots of ideas but incapable of exploiting them which is needed for innovation performance (Schumpeter, 1934).

Belbin’s (2005) examination of management teams in experimental set-ups uses as the dependent variable the results of the group work in financial terms, i.e. the economic results comprise the measurement of the degree to which the groups perform well according to the expectations. Some groups win, others loose. However, as stated by Senior (1997: 242), “the issue of what constitutes ‘success’ or high performance in real teams in real organizations, rather than artificially constituted management game playing teams, is more complex”.

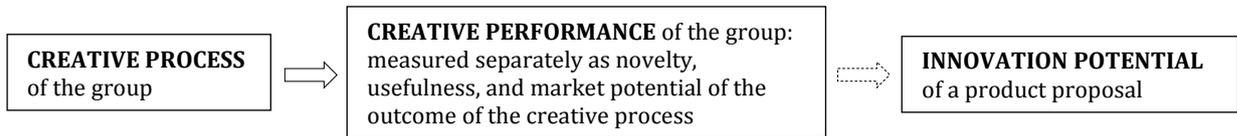
To further link research to organizational goals, more attention could be paid to the construction and measurement of variables included when investigating how group composition relates to creative and innovative performance in connection with new product development.

The widely acknowledged definition of creative performance comprises two dimensions, i.e. *novelty* and *usefulness* of an idea (e.g. Amabile, 1997), meaning that the outcome of e.g. new product development has to be original and generate value to the organization in terms of increased market share and profitability. As stated by Amabile (1997), creativity is a first step towards innovation which is “the successful implementation of those novel, appropriate ideas” (p. 40). Innovation is defined as the commercialization of an invention (Schumpeter, 1934), i.e. an idea being developed into e.g. a product that is offered to intended recipients; moreover, innovation includes the ability to exploit an invention successfully. However, to establish successful innovation, Denning and Dunham (2010) stress the importance of adding to the previous perspectives another dimension by including the adoption of a new product: a consumer may buy a new product based on an immediate evaluation of its usefulness in an intended context, but find it disappointing when starting to actually use it. This post purchase dissonance will likely discourage the consumer to buy the product again, and it may even animate the consumer to share the negative impressions with other potential consumers. The result of this may be that a new product will not perform as expected beforehand by its provider, i.e. the organization.

Building on this, in order to employ the dimensions of creative performance as indicators of innovation potential, Frederiksen and Knudsen (2013) split the usefulness dimension in two by introducing *market potential* as a third dimension: the usefulness of a new product would then ascribe to the value it may bring to its intended recipients, i.e. the consumers, whereas market potential is an estimation of the value the new product may generate to the

organization; the reported different ratings by experts of the three dimensions emphasize the need for measuring creative performance of new product development as a multi-dimensional construct.

Based on the above, proposals for new products – after idea selection and further development – could form the basis for measuring, in a real-life business setting, a group’s creative performance and link it to innovation potential by using the three dimensions mentioned, namely novelty, usefulness, and market potential (Frederiksen and Knudsen, 2013). *Table 2* offers an overview of these relationships:



*Figure 1: An illustration of how a group’s creative process leads to creative performance and how three outcome dimensions may be indicators of the innovation potential of a product proposal as suggested by Frederiksen and Knudsen (2013).*

### **Introducing team role theory**

The different findings regarding overall and creative performance of heterogeneous groups outlined in the paragraphs above call for attention and active management of diversity in organizations, but still make it worthwhile to consider composing groups according to complementarity of members. Kurtzberg and Amabile (2000-2001: 287), state that “the characteristics of team members will clearly affect the ways in which people interact, both cognitively and interpersonally”. Building on this, the suggested three dimensions of creative performance, i.e. novelty, usefulness, and market potential, necessitate a coordination of group members’ way of thinking that comprise the possibility of a 360 degrees mindset.

Belbin’s (2005) comprehensive nine-year study of the effects of different team roles on overall performance encompasses promising elements to further investigate how diversity of group members impacts creative performance and innovation potential. The results of his study indicate that it is not enough to compose groups according to complementarity of professional skills; behavioral characteristics should also be taken into consideration, e.g. because individuals with specific characteristics are likely attracted to specific professions, and because it seems that a group can only exploit its professional resources if the necessary team roles are represented in the group.

A distinction between two types of roles can be made: 1) functional roles where members effectively use their professional knowledge, experience, and skills, and 2) team roles where members act one or a set of team roles. A team role comprises a number of behavioral characteristics describing constructive contributions to a group’s work and collaboration. Functional roles may fit well with the task at hand, but in order to carry through a process of new product development, members also have to take up one or more team roles (Senior, 1997).

According to Katzenbach and Smith (1993b), a high performing team is characterized by a counterbalancing of skills, accountability, and commitment and consists of highly motivated members who take an interest in common task objectives as well as each other’s growth and success. This emphasizes the need for both functional and team role diversity; the combination of the latter is generally independent of job status and responsibilities (Dulewicz, 1995) and should further the interests of the group.

Neither creative performance, as defined by novelty and usefulness of ideas (Amabile, 1997), nor innovation potential, are directly a part of Belbin’s (2005) research but, interestingly, a recommendation that a creative group does not consist solely of creative members – other skills and characteristics need to come into play, e.g. in order to drive forward new product development towards innovation. This speaks in favor of diversity.

Hargadon and Bechky (2006) stress the importance of not just studying the creative performance in terms of an outcome of e.g. new product development, but also the moments of creative insights. They state that “creative solutions are built from the recombination of existing ideas” (p. 485) and offer a way of understanding the group

process towards creative performance by focusing on four interrelating activities that seem to precipitate moments of collective creativity: *help seeking*, *help giving*, *reflective reframing*, and *reinforcing*: seeking and giving help are implicit in group work, although not necessarily an ability shared by all group members; the definition of the problem to be solved is a pivotal activity for creative performance, and reflective reframing will help e.g. by drawing on each member's expertise to consider if a better question than the original one should be asked; reinforcing links to the values and beliefs of the group or the organization as a whole and refers to the support that members experience when seeking help, giving help, or reframing a problem.

Thus, how members approach a problem and with whom they interact may influence the creative performance of the group, which makes it important to further understand the characteristics of group members.

### Belbin's team roles

To uncover members' preferred team roles, Belbin (2005) uses both self-evaluations and observations. A Belbin Team-Role Self-Perception Inventory is a test leading to an analysis of a member's behavior and preferences in different situations. Expectedly, a member would answer the questions according to his own self-image or a desired image, for which reason it is important to compare individual member's own evaluation with observers' evaluations, e.g. during the group work.

Belbin points out seven behavioral categories to be observed in order to identify a team role: 1) asking questions, 2) giving information, 3) suggesting something, 4) raising objections, 5) delegating assignments, 6) piecing together, and 7) commenting. These observations can be juxtaposed to seeking and giving help as well as reflectively reframing, i.e. three of the interrelating activities towards collective creativity suggested by Hargadon and Bechky (2006).

Belbin's studies identify four overall characteristics and typical job functions: 1) *steady extroverts* (sales and administration); 2) *restless extroverts* (salesperson, works employee, or editor); 3) *steady introverts* (administrator, lawyer, public servant, or industrial planner); and 4) *restless introverts* (researcher and specialist working with long-term tasks). Results show that individuals have natural, strong, and preferred roles in a group, and from this nine different team roles are categorized within the four overall characteristics, namely steady extroverts: *Coordinator*, *Team Worker*, and *Resource Investigator*; restless extroverts: *Shaper*; restless introverts: *Completer Finisher*, *Specialist*, and *Plant*; steady introverts: *Monitor Evaluator* and *Implementer*. Table 2 lists the descriptions, expected contributions, and allowable weaknesses per team role:

	Team roles	Descriptions and expected contributions	Allowable weaknesses
Steady extroverts	Coordinator (CO)	Mature, self-confident, trustful. Able to prioritize. Makes goals clear and makes decisions. Notice others' talents.	A tendency to manipulate and build an empire. Not necessarily the most knowledgeable member of the group.
	Teamworker (TW)	Socially oriented, vigilantly observing. Sensitive, diplomatic, and flexible. Listens, builds, avoids conflicts, and creates a good work climate.	Can appear indecisive and insecure at crucial moments. Can seem overly sensitive.
	Resource Investigator (RI)	Enthusiastic, curious, and communicative. Politically savvy. Investigates possibilities and has network access.	Fleeting. Loses interest as soon as the first enthusiasm has settled. Talkative.
Restless extrovert	Shaper (SH)	Dynamic, highly energetic. Overcomes obstacles.	May show a savage temper. Impatient and obstinate. Has a tendency to feel provoked.

<b>Restless introverts</b>	Completer Finisher (CF)	Meticulous and conscientious. Looks for mistakes and omissions. Persistent and precise.	May have a tendency to worry too much. Perfectionistic and officious. Not willing to delegate.
	Specialist (SP)	Special knowledge and technical skills. Strong, professional engagement and self-confidence. Very focused on own tasks and objectives.	A tendency to keep to himself showing no interest in other members. Guards and contributes only in his specific field.
	Plant (PL)	Intelligent, creative, and inventive. Approaches difficult problems in new ways.	May appear weak in communicating with others. Absent-minded and not very practically minded. Sensitive to criticism.
<b>Steady introverts</b>	Monitor Evaluator (ME)	Analytical and objective. Makes precise judgments. Notices all rational aspects of an issue.	Very critical and skeptical. Very direct. Appears tardy and is not very inspiring to others.
	Implementer (IM)	Disciplined, trustworthy, and loyal. Has an eye for syntheses. Efficient during phases of implementation. Organizing, realistic, and practically minded.	Somewhat inflexible. Reacts and adjusts slowly to new possibilities.

Table 2: Characteristics of the nine team roles deriving from Belbin (2005).

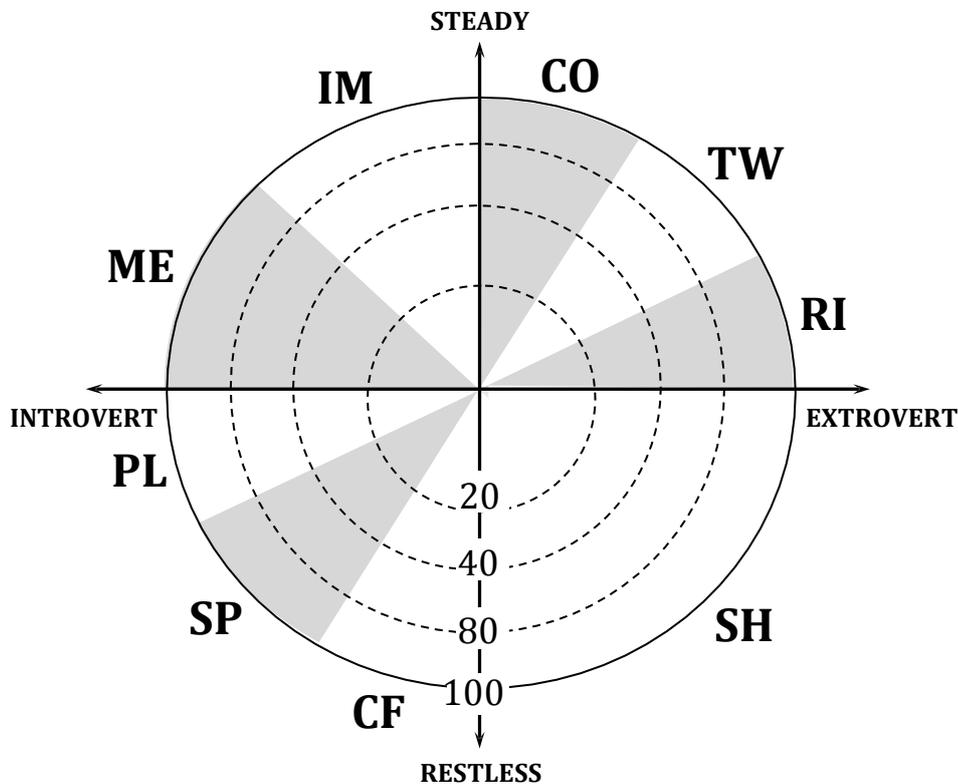


Figure 2: A system of coordinates with Belbin's (2005) nine team roles.

The nine team roles can be illustrated as a system of coordinates showing a y-axis with stable on one end of the scale and restless on the other, and an x-axis with introvert on one end of the scale and extrovert on the other (*Figure 2*). The team roles can also be divided into *thinking-roles* (Monitor Evaluator, Plant, and Specialist), *social-roles* (Coordinator, Team Worker, and Resource Investigator), and *acting-roles* (Shaper, Implementer, and Completer Finisher), which serve as a way of regarding the preferred overall behavior of each role. A high team role score is above 70 (Belbin, 2005) and signifies a person's predisposition to a certain behavior when working in a group, whereas a role score between 30 to 60 shows potential, i.e. a role that a person may be able to perform adequately.

With regard to creative contributions, Belbin (2005) suggests splitting responsibilities in connection with ideation processes, because some group members will likely be the best to put forward ideas, while others will excel in evaluating these proposals.

Building on these suggestions could lead to the conclusion of a *trio of ideation*, i.e. three team roles supplementing each other in a way that has a propensity to lead to novel and useful ideas with market potential. Belbin (2005) states that two roles are particularly predisposed for idea generation: *Plants* are per se creative, divergent thinkers with the ability to combine existing resources into new solutions, and therefore can be expected to contribute with a large number of new ideas; *Resource Investigators* are skilled in building on ideas and, although not necessarily putting forward many new ideas, the Resource Investigator may help bring in the perspectives of intended recipients as well as investigate the value that proposals may constitute to the organization. The evaluation of proposals is a natural task for a *Monitor Evaluator* who shows little ambition: the lack of personal commitment makes a Monitor Evaluator impartial and – through convergent thinking – capable of scrutinizing e.g. the potential of a group's ideas: analyzing e.g. forecasts of market share, comparing sales and cost price to the Resource Investigator's input with regard to the needs and wishes of intended recipients as well as those of the organization, and also estimating how the new product idea would fit into the existing product range of the organization. Thus, the combination of a Resource Investigator and a Monitor Evaluator may enable a focus on usefulness and market potential of the Plant's novel ideas.

According to Belbin (2005) one highly creative (and intelligent) Plant per group is sufficient as too many chefs spoil the broth, i.e. one Plant can be kept down by other, less skilled Plants who are eager to put their ideas forward. The logic of this suggestion would be that having more than one Plant in a group, can lead to the need for compromise if none of them volunteer to 'kill their darling' in terms of eliminating e.g. a proposal for a new product.

Other team roles may be needed to further conceptualize and even materialize a group's initial product ideas. An *Implementer*, who is a true company worker capable of putting aside his own interests, will show discipline and diligence in the process of carrying a new product idea all the way to production and implementation. Importantly, a cautious *Completer Finisher* can prevent the introduction of a new product to the market until it has been tried out carefully.

Throughout a process of e.g. developing a new product, a group's manager should enjoy the respect from the other members and maybe focus more on synthesis than analysis; a successful group manager is characterized by being tolerant and actively listening while considering others' suggestions, but strong enough to not necessarily follow the advice of others. A *Coordinator* has the ability to skillfully exploit members' potential by effectively managing the group, commanding respect, and inspiring confidence. However, if group members show the tendency to progress too slowly, the presence of a *Shaper*, i.e. an action-oriented initiator, can (re)vitalize the group work, especially in a group with no Coordinator.

The remaining two team roles also serve their purpose: a *Team Worker* is a trusting and sensitive personality showing great interest in the other members' well-being, and the presence of a this team role seems to benefit group collaboration; a *Specialist* is typically heavily introvert and restless and may neither be creative, empathic, nor particularly intelligent, but may possess an unsurpassed professional knowledge and experience which can be valuable to the tasks at hand. The Specialist may therefore also be important to the group despite the role's possible lack of group work competences.

*Figure 3* indicates how Belbin's (2005) nine team roles should likely be represented for a group's work to lead to creative performance. It includes the central role of a trio of ideation (PL, RI, and ME):

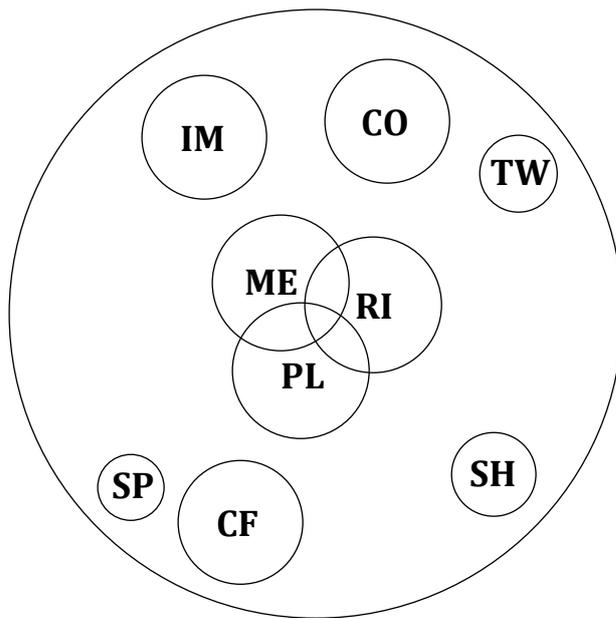


Figure 3: An illustration of how Belbin's (2005) nine team roles should likely be represented when focusing on a group's creative performance.

Worth mentioning is that some members simply will not fit in, i.e. if they are not minded for group work. On the other hand, those thought of as good members of a group have the ability to take action in due time, shift roles when needed, make room for others, as well as accomplish tasks that others would preferably avoid (Belbin, 2005).

### Comparison of team role theories

Interestingly, some of Belbin's (2005) team roles may be juxtaposed to the different problem solving approaches presented by Kirton (1989) who operates with two overall characteristics of *Innovators* and *Adapters*. As stated by Kurtzberg and Amabile (2000-2001: 286), Adapters "tend to work most comfortably within set boundaries and constraints and tend to work incrementally on problems", whereas Innovators "prefer to work on problems in a novel way and even reframe the problem itself before generating solutions". Plants and Resource Investigators approach problems creatively in different ways but both can be seen as Innovators, whereas Implementers, Completer Finishers, and maybe Monitor Evaluators resemble Adapters. So, Innovators approach problems differently than do Adapters, but in order to do well on all three dimensions of creative performance, i.e. novelty, usefulness, and market potential, both styles would be needed. The different problem-solving approaches can make it difficult, though, for the group to work together and reach common goals, and therefore Kirton (1989) introduces a 'Bridger', i.e. a member whose problem-solving style is somewhere between that of Innovators and Adapters, which enables this member to act as a translator of the ideas brought forward by the other members of the group. Thus, the Bridger may also be compared with a Resource Investigator, and because of the bridging skills of this team role it may as well be juxtaposed to Team Worker and Coordinator.

Fisher et al. (1998) operate with another grouping of team roles into *relationship roles* and *task roles*, respectively. They compare these with the two interpersonal categories defined by Wiggins (1979), i.e. *affiliation* and *dominance*, and suggest that Coordinator, Team Worker, Resource Investigator, and Implementer belong to the former category (team roles comparable to Wiggins' *gregarious-extroverted*, *warm-agreeable*, *unassuming-ingenuous*, and *lazy-submissive*), whereas Plant, Monitor Evaluator, Completer Finisher, and Shaper belong to the latter category (team roles comparable to Wiggins' *aloof-introverted*, *cold-quarrelsome*, *arrogant-calculating*, and *ambitious-dominant*).

Group members have preferred roles (Belbin, 2005), and in order to enable better predictions of the likely *secondary* team role that group members may adopt, Fisher et al. (1998) set out to investigate if any sets of management team roles occur together frequently and found that "the secondary role of a 'task' type of person will not be a 'relationship' role but a 'task' role; neither will a 'relationship' type of person be likely to adopt a 'task' secondary team role" (p. 287). As an example, if a group member can clearly be characterized as Coordinator, this member's secondary team

role would likely also be one that is steady extrovert (Team Worker and Resource Investigator) or alternatively steady introvert (Implementer).

### **The high performing group**

According to Belbin (2005), diverse characteristics and levels of intelligence among group members as well as a division of tasks according to members' skills are important for groups to reach the best results. Although it is recommended that all nine team roles should be represented to prepare the ground for high performance of a group, the most needed components of a high performing group, *in overall terms*, are listed as one Coordinator as the chairman of the group combined with one Plant who is the source of original ideas, one Resource Investigator who is the external negotiator, one Implementer who takes effectively care of practical issues, and one Completer Finisher to get the job done well. A Team Worker as the internal negotiator may come in handy, a Specialist may be needed e.g. for specific, technical tasks, a Monitor Evaluator can ensure the objectivity of group decisions, and a Shaper is relevant if more speed and not just management is needed.

Belbin (2005) mentions *the second best group* as composed of collaborating, committed, steady extrovert members (Coordinators, Team Workers, and Resource Investigators). Members with these characteristics appear to be able to compensate for the missing team roles; however, it seems very important to have a Shaper in case the Coordinator is not leading enough. Groups composed of restless introverts (Plant, Specialist, and Completer Finisher) will generally do badly, according to Belbin (2005).

Diversity does not necessarily equal dissent (Nemeth and Nemeth-Brown, 2003), but conformity pressure can be another pitfall, e.g. due to the tyranny of a possible majority within the group; the larger the group the larger the conformity pressure may be. Although nine team roles have been identified, it does not entail the need for nine group members; according to Belbin (2005), five to six members would comprise a complete group with the possibility of covering all nine team roles and substituting each other in case of absence.

A group's success depends to a great extent on members' ability to focus more on the group's objectives rather than their own personal interests (Katzenbach and Smith, 1993b). Besides domain-relevant skills, i.e. expertise, Amabile's (1988) componential model of individual creativity includes *creative-thinking skills*, i.e. the flexibility and imagination demonstrated when approaching a problem, and *intrinsic motivation*, i.e. an inner passion to solve a problem. Regarding the latter, Hargadon and Bechky (2006) operates with the term 'mindfulness' to describe "the amount of attention and effort that individuals allocate to a particular task or interaction" (p. 486), for which reason participation in group interaction will be a product not of presence within the group, but of a member's attention and energy towards the group work. Therefore, a group does not have to meet every day; to be able to function optimally the members should work closely together – but this can be done otherwise, and with a division of tasks that reflects the best possible way for each member to contribute to the group's performance.

To summarize, the balancing of the team roles seems to lead to the best results regarding a group's *overall* performance. Taking as a starting point Belbin's (2005) theory, a group's *creative* performance would also depend on having mixed team roles (*as illustrated in Figure 3*), e.g. in order to benefit from the complementary creative-thinking skills of a restless introvert Plant and a steady extrovert Resource Investigator who together will likely contribute with new and promising ideas. In order to coordinate the work and be able to carry out the tasks towards creating a product proposal that performs well on all three dimensions of creative performance, i.e. novelty, usefulness, and market potential (Frederiksen and Knudsen, 2013), more team roles should be present, especially a Monitor Evaluator who will critically evaluate ideas and solutions and thus enable idea selection, a Coordinator in order to manage the group and its work, and an Implementer to get the group's work further than just initial ideas. A Completer Finisher may be able to spot omissions, a Specialist may possess important knowledge for solving specific problems, and a Shaper may come in handy if the process seems to stall. The last team role, a Team Worker, may be able to prevent conflicts between diversity and cohesion by focusing on social aspect within the group which is also needed for high performance (Katzenbach and Smith, 1993b).

This leads to the second and last proposition:

**P2:** *The creative performance of heterogeneous groups depends on a strong representation of specific team roles among members.*

## APPROACH

This paper mainly offers a conceptualization of the links between group diversity and creative performance with innovation potential. However, a preliminary investigation is presented in order to indicate how the study of the propositions may be approached.

## Data

The data is from a student setting which does, however, resemble a real-life setting of how organizations compose groups, approach new product development, and evaluate the outcome hereof. A survey among 213 engineering students has led to a sample of 91 respondents (43%) of 20 different nationalities who, for four months, worked in 31 expertise-diverse groups with new product development from the first ideas to a well-defined concept. Beforehand, the groups were composed by their supervisor based on expertise diversity (a representation of at least 3 out of 15 different lines of study), and the groups met once or twice a week to develop a new product proposal.

Some of the data are of interest to the present study: 1) objective experts from relevant real-life businesses have evaluated the groups' creative outcome and its innovation potential on three dimensions separately, i.e. novelty, usefulness, and market potential; 2) measuring creative outcome does not reflect all aspects of the concept of creativity for which reason group members have made e.g. a subjective, social judgment by rating how they perceive group creativity and matters related to this; these self-evaluations can be regarded as an expression of group members' feelings of being creative rather than their actual creative performance; and 3) group level Belbin team role profiles are available for all 31 groups but only clearly readable for 20 groups (with an average of 6 members per group). The group profiles reflect each member's preferred team roles identified through a Belbin Team-Role Self-Perception Inventory in combination with the evaluations from four persons outside the group with whom a member has previously worked.

The group level Belbin team role profiles were put together by the students themselves in the beginning of the project period, the survey among the students was conducted after approximately two months of group work, i.e. half way through the project period, and experts rated the end results of the group work, i.e. after the project period.

## Procedure and results

This paper outlines two propositions with managerial relevance:

**P1:** *Expertise diversity positively relates to a group's creative performance (if certain member characteristics and behaviors are present, i.e. if members value expertise diversity, are intrinsically motivated to being creative in a group, and constructively contribute to idea generation).*

**P2:** *The creative performance of heterogeneous groups depends on a strong representation of specific team roles among members.*

Figure 4 illustrates how these propositions operate on both individual and group level:

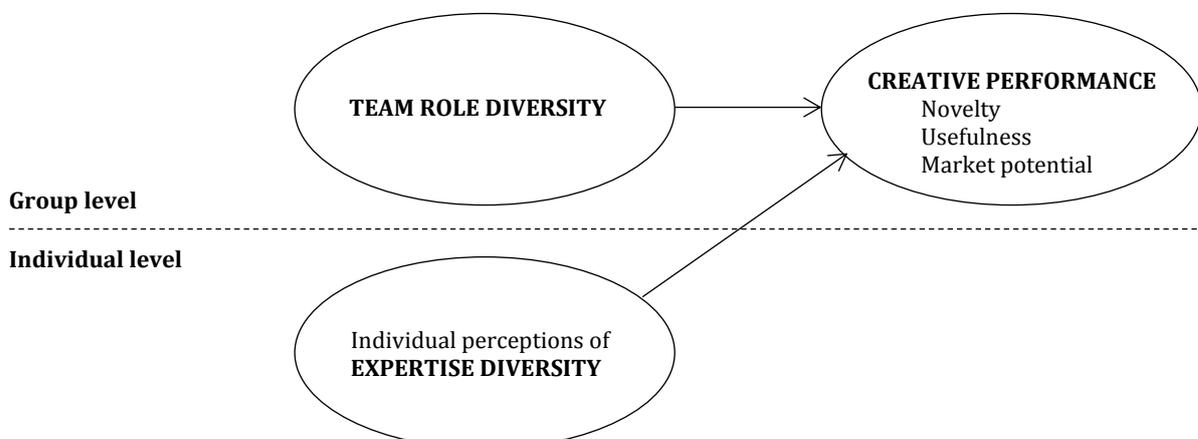


Figure 4: An illustration of how the two propositions operate on both individual and group level.

To investigate **proposition 1**, expert ratings (one expert per group) from 1-3 of novelty, usefulness, and market potential separately were coded as three dichotomous variables (1 = best; 2 and 3 = worst) and used as the dependent variables. Certain variables from the questionnaire rated individually by the students on either 7-point Likert or semantic scales were identified as the independent variables to reflect how respondents perceive the pre-composition of their group and how they value the expertise diversity as a result from this, their motivation towards being creative in the group, and their perceptions of their own creative contributions to the group. Two constructs occurred based on a principal component analysis followed by a Cronbach's alpha reliability test (*Table 3*):

Original variables	Constructs/names	Cronbach's alpha
The fact that the composition of my team was decided by the supervisors seem to influence the team with regard to its overall performance	<i>Influence of pre-composition of group</i>	
The combination of the team members' educational backgrounds allow us to perform our best	<i>Value of expertise diversity</i>	
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)	<i>Motivation towards being creative in the group</i>	.733
I am a good source of creative ideas I often have a fresh approach to problems	<i>Creative contributions</i>	.755

*Table 3: The independent variables based on original variables. The two original variables reflecting creative contributions are adapted from George and Zhou (2001).*

The first two variables both link to how members value expertise diversity of their group. *Table 4* lists the descriptive statistics of all four independent variables:

Independent variables	N	Min.	Max.	Mean	Std. dev.
<i>Influence of pre-composition of group</i>	90	1	7	3,67	1,696
<i>Value of expertise diversity</i>	86	1	7	4.13	1.629
<i>Motivation towards being creative in the group</i>	87	1	7	4.67	1.573
<i>Creative contributions</i>	82	1	7	4.54	1.229

*Table 4: Descriptive statistics for the independent variables.*

Binary logistic regressions were made to test the four independent variables against each of the three dimensions of creative performance, and the **results only partially support proposition 1**:

- *Influence of pre-composition of group* has a weak but significant and positive relation to novelty ( $b = .271, p = .044$ ), but none with regard to usefulness ( $b = -.210, p = .187$ ) or market potential ( $b = .072, p = .636$ ).
- *Value of expertise diversity* relates to neither novelty ( $b = -.069, p = .609$ ), usefulness ( $b = -.021, p = .897$ ), nor market potential ( $b = .110, p = .502$ ).
- *Motivation towards being creative in the group* shows differing results: novelty ( $b = .184, p = .195$ ), usefulness ( $b = -.371, p = .030$ ), and market potential ( $b = .097, p = .565$ ); thus, it appears that motivation relates significantly, but negatively, to usefulness.

- *Creative contributions* relates to neither novelty ( $b = .165, p = .463$ ), usefulness ( $b = .002, p = .992$ ), nor market potential ( $b = -.190, p = .306$ ).

To investigate **proposition 2**, expert ratings of the groups' creative performance on a scale from 0-100 % were used to identify whether the groups were rated high on all, some, or none of the three dimensions of creative performance, i.e. novelty, usefulness, and market potential; 76% and above was thought to be a fair indicator of high performance and below 30% a fair indicator of low performance. Next, the group level Belbin team role profiles were studied to identify which roles were above 70 (the threshold value proposed by Belbin, 2005) and thus strongly represented in the groups.

Table 5 lists the strongly represented team roles as well as expert percentage-wise ratings of novelty (Nov), usefulness (Use), and market potential (MP) of the 20 groups.

Group	CO	TW	RI	SH	CF	SP	PL	ME	IM	Nov	Use	MP
1										50	99	82
2										82	30	19
3										60	55	9
4										35	85	82
5										81	15	12
6										77	74	60
7										82	32	11
8										13	13	13
9										23	10	38
10										25	20	25
11										70	47	60
12										95	88	87
13										75	68	63
14										61	47	46
15										40	41	38
16										2	84	86
17										73	73	53
18										92	79	86
19										82	82	54
20										22	42	70

Table 5: Overview of strong Belbin team roles per group and how the groups performed on the three dimensions of creativity:  = strong team role. Nov = novelty; Use = usefulness; MP = market potential.

Investigating the *trio of ideation*, i.e. a Plant as a divergent thinker and generator of many new ideas, a Resource Investigator as an enhancer and investigator of ideas, and a Monitor Evaluator as a convergent thinker analyzing the ideas, would imply that the strong representation of these roles could lay the ground for creative performance with highly novel product proposals that are also useful and hold market potential. Twelve groups (1, 2, 3, 6, 9, 10, 11, 12, 14, 18, 19, and 20) out of the twenty are represented by a Plant (PL), a Resource Investigator (RI), as well as a Monitor Evaluator (ME); however, no consistent pattern occurs. PL is represented in all groups, RI in thirteen of the groups (except 4, 5, 8, 13, 15, 16, and 17), and ME in sixteen of the groups (except 4, 7, 8, and 17). There are three groups represented by neither RI nor ME: one of the groups (8) is rated very low (13%) on all three dimensions of creative performance; another group (4) is rated quite low (35%) on novelty, but high on both usefulness (82%) and market potential (82%); and the third group (17) is rated at a medium level on market potential (53%) and high on both novelty (73%) and usefulness (73%). This leaves a blurred picture of the importance of a trio of ideation.

Theoretically, the strong representation of the other team roles may not be important specifically to the creative but to the overall performance of a group, which makes it relevant to investigate a possible pattern. The team role Coordinator (CO) is represented in only nine of the groups (1, 3, 6, 7, 11, 14, 18, 19, and 20), but looking at the groups with and those without a CO shows no consistent pattern of how this team role affects the creative performance of the groups. The lack of the natural manager could be compensated for by a Shaper, i.e. one that focuses on the progress of the group: Shapers (SH) are only represented in seven of the groups (2, 4, 7, 9, 15, 18, and 19), but again there is no consistent pattern of creative performance when comparing those with and those without this team role. Seven of the groups are represented by neither a CO nor a SH (5, 8, 10, 12, 13, 16, and 17). Focusing on these groups does not give a clearer picture of the importance of management and leadership roles in a group, but by focusing on the groups that were not rated high on any of the three dimensions of creative performance (3, 8, 9, 10, 11, 13, 14, 15, 17, and 20 ) it appears that all of them were without either a CO or a SH, and that six of the nine groups had no CO.

The team role Team Worker (TW) is represented in all but one group (4). Eighteen of the groups have a Completer Finisher (CF; except 5 and 17), sixteen have a Specialist (SP; except 4, 5, 12, and 17), and fifteen have an Implementer (IM; except 4, 5, 9, 11, and 15). Again, the representation or not of these team roles does not seem to influence the creative performance of the groups.

Only two groups (12 and 18) were rated high on all three dimensions of creative performance: in one of the groups all team roles were represented, whereas in the other CO, SH, and SP were missing. Looking at the groups where eight or all nine team roles were represented (1, 2, 3, 6, 7, 14, 18, 19, and 20) indicates that the (almost) complete balancing of the team roles positively affects some dimensions of creative performance in six out of the nine groups, whereas in groups where two or more team roles were missing (4, 5, 8, 9, 10, 11, 12, 13, 15, 16, and 17) only five out of eleven groups were rated high on some of the dimensions of creative performance. This underlines the importance of a balancing of team roles in a group with regard to the positive impact on creative performance, and hence lends **some support to proposition 2**.

## DISCUSSION

The paper presents two propositions:

- P1: *Expertise diversity positively relates to a group's creative performance (if certain member characteristics and behaviors are present, i.e. if members value expertise diversity, are intrinsically motivated to being creative in a group, and constructively contribute to idea generation).*
- P2: *The creative performance of heterogeneous groups depends on a strong representation of specific team roles among members.*

Of interest to management, preliminary analyses of proposition 1 show mixed results. Perceived influence of the pre-composition of groups on the overall group performance positively relates to novelty of the project outcome. The purpose of pre-composition was explicated to the respondents before they rated the statement; thus the vague explanation of this relation may be that the awareness of predetermined expertise diversity aiming at complementarity of members has made them eager to create something new by combining each of their different skills and experiences. The motivation for behaving creatively in the group is negatively related to usefulness, meaning that the lower the individual motivation for creatively engaging with other group members, the more useful the final product proposal will be; this may indirectly support the statement by Belbin (2005) that a high performing group does not necessarily have many ideas to choose from, but instead a few high quality ideas, e.g. because group members do not sit together generating highly novel but less relevant ideas with regard to the usefulness and timing of these.

The two results are different in terms of directions (positive versus negative) and dimensions (novelty versus usefulness); this, in combination with the insignificant results from the regression analyses, lend support to the need for measuring the dimensions of creative performance separately (Frederiksen and Knudsen, 2013; Sullivan and Ford, 2010). Although the results do not in particular support the need for including market potential as suggested by Frederiksen and Knudsen (2013), it can, however, neither be concluded that market potential is not important to include as a separate dimension.

Focusing on proposition 2, group composition in terms of the representation of all or some of the nine team roles as defined by Belbin (2005) does not leave a clear picture of how it links to the dimensions of creative performance; however, it shows that in most of the groups rated high on some or all dimensions there is (almost) a balancing of the nine team roles. This could be further linked to other team role theories such as Kirton's (1989) Innovators and Adapters or Fisher et al.'s (1998) relationship and task roles. Also, results indicate that managerial team roles are important to the creative performance of groups.

Although the results presented in this paper regarding team roles and the creative performance of expertise-diverse groups are ambiguous, there may still be a link between balanced team roles and expertise diversity: Belbin's (2005) suggestion that people with certain characteristics will likely choose specific types of jobs would mean that if a group is composed of members with diverse expertise, there is a propensity that various team roles may be represented. This might explain the rich representation of team roles in most of the twenty groups that were composed of students from at least three different and expectedly complementary lines of study.

The widespread use as well as the usefulness of Belbin's theories in organizations are acknowledged, but more scholars question the empirical validity of his experimental research and therefore further investigate e.g. the need for balancing of team roles (e.g., Aritzeta et al., 2007; Prichard and Stanton, 1999; Fisher et al. 1998; Senior, 1997; Dulewicz, 1995; Furnham et al., 1993 whom Belbin (1993) answers back). On the whole, the theories find sufficient support. Senior (1997), who contributes with a validation of the theories based on research in a real life setting, raises methodological issues to be addressed: "a) how to identify a person's 'natural' team role" and "b) how to measure whether a team is balanced or not" (p. 243). Her investigations hereof lend support to the way of determining a person's team roles by combining Belbin's Team-Role Self-Perception Inventory and observer checklist results, and also some support to the link between team role balance and group performance (which is later significantly supported by Prichard and Stanton, 1999); however, it is underlined that a group may even be considered balanced if some team roles are represented only at a medium level and a few roles are maybe even absent. This is in line with the findings in this paper.

Hargadon and Bechky's (2006) investigations of companies like IDEO and McKinsey suggest that collective creativity often happens in randomly selected groups, e.g. in the hallway or by summoning the colleagues who are present at the time. Thus, making sure that all the needed team roles are represented is made difficult in such real-life situations, which also holds interesting perspectives for future research, e.g. of how team role representation is linked to these randomly composed and often shortly existing groups. Future research may focus on team roles simply by asking group members to evaluate themselves, e.g. by using Likert-scales on each of the seven characteristics suggested by Belbin (2005), and then observe groups in action while ticking off every time a group member either asks questions, gives information, suggests something, objects, delegates assignments, pieces the group's work together, or comments on e.g. ideas.

It takes time to develop a product that is both novel, useful, and has market potential, and therefore it seems important to consider e.g. iterations of generating and evaluating several ideas, incubation time, further idea development, and inclusion or exclusion of ideas for conceptualization – i.e. to investigate ongoing projects rather than 'on the spot' experiments. Based on a study of whether or not a group leaders' strongest roles would match the ones required throughout different project stages (such as identifying needs, finding ideas, formulating plans, making contacts, establishing the organization, and following through), Senior's (1997) conclusions of a "link between the stages of a team's project or activities and the need for different team roles to be dominant at different stages" (p. 246), lend some support to Belbin's (2005) theories. This linking of team roles to project stages is a promising avenue for further research.

Although there are resemblances to real-life contexts, the results presented in this paper are limited to a student setting. Additionally, only 20 groups lay the ground for the investigation of the links between team roles and group performance. None of the groups were composed according to team role theory but on the basis of expertise diversity. However, most students were aware of the potentials of and therefore to some extent tolerant towards diversity, from previous projects they had heard of the claimed importance of a balancing of team roles, and they knew their own preferred team roles. By drawing their group's team role profile they were able to actively make decisions of how to fill in missing roles if necessary. Thus, this awareness may have influenced the way the students approached the

project work, taking precautions by e.g. appointing responsibilities to specific members and thereby compensating for weak or non-existing team roles.

Moreover, the age span in the student setting used for analyses in this paper (the average age was 24 years) does not reflect that of a business setting; however, Lettice and Özbilgin (2012) found that innovation teams in organizations are mainly comprised of younger employees, partly because it is difficult to attract older people to this kind of expectedly uncertain, dynamic tasks.

Further research, in a business setting, is going to be carried out to investigate the two propositions, including the need for separately measuring all three dimensions of creative performance, as well as how other types of diversity link to these dimensions. Inherent in the data set used for the preliminary investigations are more parameters that could inform these linkages, and to investigate the two propositions more parameters and more methods could certainly have been used to further analyze potential links; however, the focus of this paper is, based on theories of the impact of expertise and team role diversity mainly, to conceptualize possible links that can be investigated further in a real-life setting.

It is fair to call this a preliminary investigation, yet it includes promising perspectives with managerial implications.

## CONCLUSION

This paper contributes to the creativity literature by pointing out the necessity of carefully defining the concept of creative performance of groups before measuring the impact of e.g. diversity, as well as by including team role theory into the equation. From the preliminary investigation, mixed results with relevance to management occur that need further clarification though. Therefore, future research avenues are outlined including the relevance of conducting research, preferably throughout a process of new product development, in a business setting instead of among students or as experimental set-ups.

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