THE ROLE OF NOVELTY IN IDEA SELECTION DECISIONS BY MANAGERS AND EMPLOYEES

A Master's Thesis submitted for the degree of
"Master of Business Administration"

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Zurich, August 2013

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Affidavit

I, **Ronja Müller-Bruhn**, hereby declare

1. that I am the sole author of the present Master's Thesis, "THE ROLE OF NOVELTY IN IDEA SELECTION DECISIONS BY MANAGERS AND EMPLOYEES ", 50 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
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Vienna, August 18, 2013

R. Müller-Bruhn

Signature

PREFACE

This thesis is the result of many helping hands. Let me start with thanking the 'seed' of the innovation team contest, namely the organization team with whom I have eaten and planted many apples – the symbol of the contest – during the process of establishing this event. The 'nutrients" of the Winterthur management team allowed us to create a fundament on which the participating teams let their ideas 'prosper" to result in a compelling idea exhibition. Thank you to all helping hands at Zimmer GmbH.

I want to express my gratitude to Marion Pötz and Jörg Schönhärl for mentoring me in the process of framing the experimental content. Their stimuli will keep on having an impact beyond my MBA program.

I personally thank my husband for supporting me and being patient with me during my MBA program. And I warmly thank my versatile family and my friends who gave me insightful perspectives along the way.

I would also like to thank the WU Executive Academy and the TU Continuing Education Center for creating an MBA program that allowed me to dig deeper into my special interest of innovation and entrepreneurship and meet many sparkling peers.

ABSTRACT

Selection amongst proposed innovation projects is crucial to invest and allocate resources in the most beneficiary and profitable way. In early phases of an innovation process, ideas or concepts are presented to decision-makers, who have to make investment decisions. In order to evaluate those ideas, criteria such as novelty, feasibility or user benefit have been used earlier to structure the idea evaluation process in order to substantiate idea selection and investment decisions. Previous studies in the scientific environment have found a systematic penalty for novelty during the idea evaluation process. This study investigates whether such a negative bias against novel project proposals can be confirmed in the context of an innovation team competition in the industry environment. The results, however, indicated that novelty had a positive impact on the investment decision of both the managers and the employees who evaluated the ideas. Therefore no negative novelty bias could be confirmed within the current study. The idea evaluations in terms of novelty, feasibility and user benefit were very consistent between manager and employees. Several distinct interaction effects between novelty, feasibility and user benefit were found. Furthermore, evaluators applied different evaluation patterns for different type of ideas. When favorite ideas were chosen by managers, both novelty and feasibility preferences of individual raters were observed. The study showed distinct idea evaluation patterns in the industrial setting, demonstrating that contextual conditions matter.

TABLE OF CONTENTS

Contents

TABLE OF FIGURES

LIST OF TABLES

1. INTRODUCTION

How do managers and employees react to novel ideas?

Novel ideas are often associated with extra efforts for employees and with investment requirements for managers of industrial companies. Industry-specific barriers to innovation may furthermore impede the adoption of novel ideas. It therefore requires a positive attitude towards novel ideas and innovation in order to successfully overcome the hurdles along the way of an innovation process (Wiklund & Shepherd, 2005).

Successful innovation projects are the key to keep a positive attitude of people towards novel ideas, because it is well known that success encourages people to keep on going (Weiner, 1985). Furthermore, success is needed purely from a financial perspective because budgets for innovation are typically constrained and thus have to be well invested. Therefore, companies have to carefully select the most impactful ideas upfront in the very early stages of the innovation process and choose amongst innovation projects in the most beneficiary and profitable way.

While the cost of failure is less at the earlier stages of the innovation process (Stevens & Burley, 2003), this early stage work is the essential predictor of later success or failure (Cooper & Kleinschmidt, 2007; Khurana & Rosenthal, 1998). Because it can take up to 3000 initial ideas to develop one market success (Stevens & Burley, 1997), this early stage selection work plays an important role in the innovation process.

In order to substantiate the decision-making process under uncertainty and novelty in these early stages of the innovation process, thorough up-front homework was recommended (Cooper & Kleinschmidt, 2007), the importance of an innovation process per se was highlighted (Potts, 2010) and software tools (Hüsig & Kohn, 2009), rating criteria and financial models (Cooper & Kleinschmidt, 2007; Blohm et al., 2011; Griffin &

Page, 1996; Hart et al., 2003) were developed. Despite these important developments, uncertainties will remain which have to be interpreted and judged by human beings.

Where people judge and assess ideas, there is a chance that decisions are influenced or biased in one way or the other. Especially when it comes to a judgment of innovative ideas where information is limited, people tend to rely on their experience and use simplifications or other so-called heuristic principles to reduce the complexity of the situation and make a decision. Such heuristic principles are generally useful, but sometimes may lead to systematic biases. (Tversky and Kahneman, 1974)

Literature has presumed that people have an inherent bias against novel ideas in science (Kuhn 1970) and they prefer familiar and plausible ideas over novel ideas (Rietzschel et al., 2010). A recent study by Boudreau (2012) has confirmed such a bias against novel ideas in an expert peer review experiment in the academic sciences.

A negative bias against novel ideas would create an additional barrier against innovation on top of the industry specific constraints. It is essential for companies who want to innovate successfully that they have people with an entrepreneurial mindset, who are willing to take these hurdles in order to create something new (Wiklund & Shepherd, 2005). The current study therefore investigates whether such a bias against novel ideas can be observed also in the context of an innovation team contest at an industrial company, investigating it from both the management and employee perspective. The core underlying research question is therefore:

How does novelty influence idea selection decisions by managers and employees in the industry environment?

The current study focuses on an innovation team contest of a medical company called Zimmer GmbH. This company operates in a particularly interesting environment with respect to the research question. There are multiple barriers to innovation in this industry, as summarized by the World Health Organization (2010). 31 million U.S. dollars have to

be spent on average by a medical devices company just to take a product through the required registration process called 510k (Makower, 2010). After going through such a cost intensive registration process, medical device companies can not accept failure rates of 40%, which were reported by Stevens and Burley (1997) for launched products. Furthermore, every single process change is subject to additional regulatory requirements such as the change control, which often involves revalidation efforts, time and investment. In such an environment, it is crucial to select the right ideas and bring them to success in order to sustain a positive attitude towards innovation.

The current study design was set up to investigate the reaction of both managers and employees to novel ideas at Zimmer GmbH. To empirically investigate whether managers and employees indeed respond negatively to novel proposals, we initiated an innovation team competition where 11 teams developed their ideas into project proposals over a time period of three months. Therefore the term project proposals will be used in the following when referring to the developed ideas. Rating sheets were developed to evaluate the team proposals. Managers and employees filled out the rating sheets for each proposal, judging the novelty, feasibility and user value for each idea, which represent widely used criteria to rate ideas (Blohm et al., 2011; Poetz & Schreier, 2012). In addition both the managers and the employees were asked to make a simple go/ no go decision whether they recommend that the company should invest in the proposal ('go') or whether the company should reject the proposal ('no go'). Subsequently it was investigated whether novel ideas got relatively more 'no go' decisions, which would suggest a negative bias against novel ideas, or whether novel ideas got more 'go' decisions suggesting a pro-novelty behavior. Also, we took the other rating criteria into account in order to control for other decision mechanisms, and observed the managers during their discussions which idea they actually preferred most. And finally, the data allowed conclusions about management versus employee evaluation behavior.

Using this approach this study analyses a) how novelty influences resulting idea selection decisions in the context of other criteria, and b) how managers and employees can be compared in terms of their proposal evaluation behavior.

Based on the analysis, the following sub questions can be addressed, which may lead to concrete practical implications:

- ***Is there a bias against novel ideas?*** Such an observation would be an additional barrier to innovation on top of other innovation barriers that may be present.

- ***How does the openness to novel ideas vary between the different individuals?*** Understanding this better could help to clarify what needs to be considered when selecting people to rate and judge (novel) ideas.

- ***Do managers and employees have similar idea evaluation processes?*** If yes, the practical application could be that certain pre-screening processes could be delegated to employees.

As a side effect, the data may also allow to draw conclusions upon the general idea evaluation process:

- ***How do rating criteria interact and how do they shape the final investment decision?*** Patterns may be detected, and the awareness of such patterns may help making intuitive decision-making principles more conscious.

- ***Is there a distinct pattern in decision-making with respect to the rating criteria?*** If so, such information could be used for automatic idea selection processes if high idea quantities were to be evaluated and compared.

- ***What benefits can be observed using a criterion-based rating process?*** An understanding of those benefits would help to design the idea evaluation process.

It is therefore important, to analyze the idea evaluation process of the team proposals at Zimmer GmbH, with a focus on the reaction of both employees and managers to novel proposals.

2. OBJECTIVE

The objective of this study is to investigate how idea novelty influences idea selection decisions of managers and employees in early stages of the innovation process, in the context of an innovation team contest at Zimmer GmbH.

Chapter 3 starts with summarizing what is known about idea assessment by different people and rating groups. It proceeds with firstly the role of novelty in decision making in general and secondly the role of novelty during idea assessments in specific. Chapter 4 explains the materials and methods starting with an overview on the team contest in which the team proposals were generated and developed, proceeding with the idea assessment technique used for idea evaluation and finally explaining the data collection and introducing the comparisons that are needed to investigate the objective of this study. Chapter 5 starts by summarizing the results on proposal level with a focus on the role of novelty on investment decisions. It proceeds with showing how the individually perceived ratings of novelty, feasibility and user benefit impact the related go/ no go decision. Also interdependencies between the rating criteria are being investigated, as well as category-specific observations with respect to the type of proposal. Finally, proposal preference decisions of the managers are regarded more in detail.

Chapter 6 discusses the results related to the questions raised within the introduction, and finally in chapter 7 the most important aspects of the current paper are summarized and concluded.

3. DECISION MAKING AND THE ROLE OF NOVELTY

3.1. The Role of Evaluator Experience for Idea Assessment and Decision Quality

People who participate in the idea selection process may have different backgrounds. It is widely accepted that idea evaluation is done by a cross-functional management team or by trained independent judges (Cooper & Kleinschmidt, 2007; Magnusson et al., 2012; Rietzschel et al., 2010). Also peer and self-evaluation has been used for innovation contests (Bullinger & Moeslein, 2010; Rietzschel et al., 2010). New and more automated idea evaluation models such as 'idea stocks' (Soukhoroukova et al., 2007) or user ratings (Magnusson et al., 2012; Rietzschel et al., 2010) are attempts to automatize and outsource the idea evaluation process.

There have been a few studies on outsourcing the rating of ideas towards participants or users. In a study by McGill (2002) the end-users overestimated reliability, understandability and user-friendliness compared to independent experts, and rated effectiveness and portability of their applications relatively lower. However Rietzschel et al. (2010) showed that while the idea selection of participants was not comparable to the idea assessment of trained raters, the assessment of pre-determined rating criteria (originality and feasibility) of those ideas was comparable. Also a recent study by Magnusson et al. (2012) showed that both technically skilled users as well as ordinary users rated the ideas in a conforming manner compared to the professional experts in terms of a relative comparison. Thereby users were asked to rate 'Originality', 'User value' and 'Producibility'. This was again confirmed by Riedl at al. (2010) who found that user rating was useful if a rating sheet was used that divides ideas into novelty (comparable to originality), user value, feasibility (comparable to producibility) and elaboration. In contrast, simple binary (e.g. go/ no go) and non-specific five point rating scales were not

shown to be comparable to an independent 'jury' rating (Riedl et al., 2010). Riedl et al. (2010) therefore concluded that the design of the rating sheet determines the comparability of user ratings with independent jury ratings. In summary, those studies indicate that user or peer rating of ideas can be effective if clearly defined idea rating criteria are used that structure the idea evaluation process.

In the academic background, peer reviews are widely used. The preference biases in terms of age, gender, connections, nationality, rank and others that are associated with academic peer reviews (Marsh et al., 2008) indicate that blinding may be favorable to assess the research proposals more objectively (Boudreau et al., 2012). It was also shown in this context that ratings by assessors who rated three or more proposals were harsher, more reliable and more valid (Marsh et al., 2008). It may be hypothesized that reviewing multiple ideas increases the experience curve and allowes for a better relative comparison, which enhances idea evaluation quality.

Expertise was stated to be favorable for the decision making process in order to not overestimate the quality of the ideas, at least within the domain of expertise (Chi, 2006; Shanteau, 1992; McGill, 2002). Relevant knowledge may lead to a more critical view and though lower ratings. Literature distinguishes between *demand side knowledge* (Magnusson et al., 2012), which is also referred to as use experience (Lüthje, 2004) or user need information (von Hippel, 1994), and *supply side knowledge* (Magnusson et al., 2012), which is also referred to as product related knowledge (Lüthje, 2004) or manufacturer information (von Hippel, 1994). Magnusson et al. (2012) relates supply side knowledge to a good judgment of the feasibility side of ideas, whereas he relates demand side knowledge to a good judgment of the user benefit side of ideas.

From a knowledge perspective, users should have solid demand side knowledge, however the supply side knowledge may be judged incomprehensively by this group. Yet, the studies by Magnusson et al. (2012) and Riedl et al. (2010) suggest that there is a good relative overlap between professional experts' rating and users rating, if rated by the three

universal rating criteria novelty, user value and feasibility. It is interesting to see within the current study how pronounced the overlap in the idea rating process will be between employees, who may have a good supply side knowledge and a management team of a professional 'jury', that consists of an independent cross-functional management team and should have both supply side and demand side knowledge.

Rating of ideas by professional 'experts' (in the current study named managers) is often referred to as a standard of reference. The consensual assessment technique was introduced by Amabile (1996): "As long as there is a good degree of agreement in the independent judgments made by experts (and there usually is), then composites of their ratings can be used as the creativity measures." (Amabile, 1996, p. 4) This assessment technique has been widely accepted and used ever since (Cooper & Kleinschmidt, 2007; Blohm et al., 2011; Franke et al., 2006; Bullinger & Moeslein, 2010; Matthing et al., 2006) and has been used as a reference standard for the validity of alternative rating methods (Magnusson et al., 2012; Rietzschel et al., 2010). Amabile (1996) already stressed out the importance of relevant knowledge, and stressed out the relevance of domain experience in order to recognize creativity. In order to optimize the rating quality, a jury should have experience with the assessment of previous ideas, which optimizes their relative rating capabilities and potentially idea rating quality (Marsh et al., 2008). As suggested by Cooper & Edgett (2006), the gatekeepers should furthermore be represented by a cross functional decision team of senior managers, who own the resources for potential opportunities or could help make them available.

If the results indicate conforming rating processes between the employees and managers, the managerial application could be that employees or peers pre-select ideas via rating certain criteria, at least for ideas where mainly supply side knowledge is needed. The purpose of this paper is accordingly to investigate the appropriateness of delegating the initial idea pre-screening of new product or service ideas to employees instead of assigning this to professional experts.

3.2. Rating Criteria Used to Evaluate Ideas

Previous studies have identified key rating criteria in order to assess relevant ideas. While a multitude of rating criteria is suggested by literature (Cooper & Edgett, 2006; Baker & Albaum, 1986; Hart et al., 2003; Carbonell-Foulquié et al., 2004), recent studies have identified universal idea rating criteria. Blohm et al. (2011) concluded after an extensive literature review that most of these rating criteria can be categorized into one of the four different dimensions: novelty, relevance (for the user), feasibility and elaboration (Blohm et al., 2011). Poetz and Schreier (2012) came to a similar conclusion, they identified the three key variables novelty, customer benefit and feasibility after reviewing previous literature. Amabile (1996) also highlighted the importance of novelty and usefulness of innovative ideas. Therefore it may be concluded that the most important rating criteria may refer to novelty, feasbility and the benefit or value for the user or customer. Usefulness, customer benefit and user value can be used as synonyms, because if a solution is useful, it should also create value or benefit to the user. We will stick to the expressions *user value* because some ideas presented in the innovation team contest have internal users that benefit most from the idea. The expression used for the global rating criteria of the current study will therefore be novelty, feasibility and user value in the proceedings of this paper.

Another important aspect relates to the interaction between those rating criteria. It was shown earlier that feasibility and novelty were negatively correlated (Kristensson et al., 2004; Poetz & Schreier, 2012), meaning that novel ideas may typically be less feasible and less novel ideas may typically be more feasible. This is an interesting aspect to analyze with the data of this study as well.

3.3. Human Decision Patterns and the Role of Novelty

It is rather a subjective perception whether or not an idea is novel (Wells et al., 2010). In other words: "an innovation is not 'something new', but more appropriately referred to as 'something that is *judged as new*'" (Schweizer, 2006, p.166). This would indicate, that for a given actual novelty (actual novelty compared to existing solutions available), the person's experience will determine to what extend this person *judges or perceives* the idea as new (refer to Figure 1 for a simplified illustration). This judgment or perception will strongly depend on the experience of the person within the regarded domain, as explained in chapter 3.1. Amabile (1996) stated that the consensual assessment technique, which is based on the assumption that experience is available to the judges, will lead to a good degree of agreement as to what is creative (or novel) and what is not.

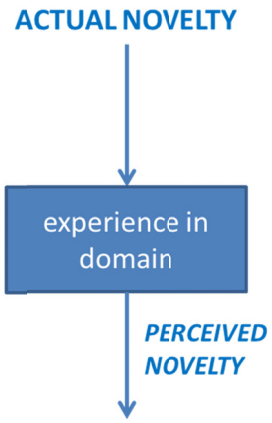

Figure 1: Simplified schematic illustrating that for a given actual novelty, the person's experience will determine to what extend the idea is judged or perceived as new

And yet, for the same perceived degree of novelty, people may favor novelty differently in different situations. Novelty can induce both positive emotions such as excitement or interest and negative emotions such as fear or uncertainty, as summarized by Wells et al. (2010). Amongst others, the *novelty seeking* characteristics of a person will determine whether the person is open to a respective novel solution or not (Cloninger, 1986).

Novelty seeking is characterized a personality trait (Cloninger, 1986). A related classification has been made by Rogers (1962) who classified consumers based on their willingness to adopt new technologies. More specifically, there is evidence substantiating a causal relationship between novelty seeking and the so-called "novelty seeking" dopamine D4 receptor gene (Okuyama, 2000; Ebstein, 1996; Schweizer 2006), indicating a genetic cause for the novelty seeking characteristics of an individual person. But not only genetics, also the environment, namely parents and role models can additionally influence exploratory and creative development (Schweizer, 2006). As a consequence, both genetics and environmental or learning factors could influence the novelty seeking characteristic of an individual person during a concrete decision. And moreover it was stated that it depends on the object category whether people prefer familiar or novel images, indicating that task-context matters as well (Liao et al., 2011). Therefore, the final decision is always multi-dimensional and may consist of a mix of individual preferences, but also strategic and rational considerations where also multiple other relevant criteria are taken into account (refer to Figure 2 for a simplified illustration).

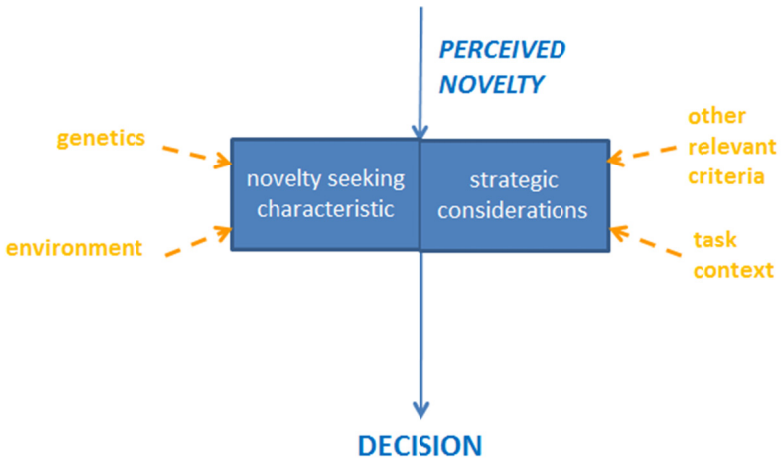

Figure 2: Simplified schematic illustrating that the perceived novelty can be processed differently by different individuals before the final idea selection decision is made

If we transfer these findings to the idea evaluation process, (1) the novelty of one and the same idea can be perceived differently by different individuals, and (2) this perceived

novelty can be processed differently by different individuals influencing the idea selection decision. Chapter 5.2 incorporates also the first aspect (1) of the decision-making process, namely it starts from an average rated novelty of each of the eleven proposals, which may be representative of the true mean novelty of the proposals at least relatively in the context of the sample of proposals regarded. This approach will also allow comparing ratings of different rating groups for the different proposals. Chapter 5.3 will focus mainly on the second aspect (2) of the decision-making process, namely identifying a pattern how the perceived novelty shapes the final go/ no go decision or idea preference decision in early stages of the innovation process.

One question that remains to be discussed is whether novelty-seeking is an individual characteristic only which may influence the idea selection decision, or whether there is a trend or 'common' pattern towards or against novelty, which will be part of the next section.

3.4. The Influence of Novelty on Idea Assessment and Judgment

The following studies provide an insight whether there is also a general trend towards or against novelty. Rietzschel et al (2010) found that there is an unconscious preference for feasibility and desirability amongst psychology students participating in an idea selection process, suggesting a negative bias against novelty. These findings are similar to the results of other studies, which found that generally people tend to rate items more favorably that that are familiar to them compared to new items (Begg & Armour, 1991; Garcia-Marques & Mackie, 2001). This finding was relativized by the finding by Liao et al (2011) that it depends on the object category whether people prefer familiar or novel images. In terms of science it was argued that people tend to stick to the status quo when choosing among alternatives (Samuelson & Zeckhauser, 1988; Kuhn, 1970) unless interrupted by a scientific revolution (Kuhn, 1970).

In summary, people may generally tend to prefer familiar items compared to new items, but this preference will also depend on the object category or task context.

Specifically referring to a 'novelty bias' during the idea selection process, the most related study was published by Boudreau et al (2012). The study focused on research projects that were assessed using a peer review process for medical research grant proposals at a leading medical research university. The study found a systematic penalty for novel proposals, which was robust to unobserved proposal quality and alternative explanations. Deeper investigation revealed reasons being information effects rather than strategic effects or lesser perceived feasibility. (Boudreau et al., 2012)

Another study by Tatikonda and Rosenthal (2000) found a positive association between technology novelty and achievement of the technical performance outcome and speculates that firms may routinely underestimate their ability to achieve technical goals, so they may consequently be negatively biased against novelty when selecting ideas in the early stages of the innovation process. Such an underestimation of the own abilities can be explained because during the process of developing, teams unearth new competencies. This would suggest that firms may underestimate their ability to implement novel solutions, which would in turn suggest that firms may underestimate the feasibility of novel ideas. (Tatikonda & Rosenthal, 2000)

In summary, earlier studies may rather suggest an anti-novelty behavior than a pro-novelty behavior in early stages of the idea selection process, with the main related article in the idea evaluation domain of Boudreau et al. (2012) in the university environment for normal science. Returning to the current study and the objective, it is interesting whether the current study can replicate a negative association of novelty on the acceptance of ideas also within an innovation competition in the industry environment, and how a potential novelty behavior may differ between different rating groups. This research context in the medical devices industry is especially interesting because openness to novel solutions is required in order to innovate in an environment with many barriers to innovation.

4. MATERIALS & METHODS

4.1. Overview

In order to address the objective outlined above, an innovation contest was created that generates well elaborated project proposals which can be rated by different evaluators. The proposal development and display was organized in a way that both managers and the employees could get fully familiar with the ideas and concepts behind the project proposals that were suggested by the teams. Managers and employees were asked to make an investment decision, or, in other words, to decide whether the company should invest in the idea ('go' or 'no go'). Furthermore they were asked to give an estimate how novel they perceive the idea to be and also other rating criteria including feasibility and user value were assessed for each proposal. The novelty criterion was related to the investment decision in order to measure the reaction of people to novel ideas. The rating process was organized in a way that very complete data was gathered from each rating person on each team proposal, which allows to put the effect of novelty in a relative perspective to other criteria and other relevant factors as well.

4.2. Idea Generation: Innovation Contest

The innovation contest was designed to motivate teams to work on ideas and to ripen them towards a maturity level on which those ideas can easily be picked by the management and implemented. The team competition was called 'innovaZion Rallye' and used an apple as a symbol to underline the ripening process of ideas. Such ripening includes a culture of up-front homework. This is important because it was shown earlier that up-front homework and feedback stages before the first go/ no go decision point were crucial to success (Cooper & Kleinschmidt, 2007). In the past, ideas were submitted with a few sentences and without a concept behind the submitted idea. The 'unripe' nature of such ideas made the review process difficult and inefficient for management

because a lot of related information was unknown. Therefore, the entire innovaZion Rallye was designed to ripen ideas towards concepts (and the apple symbolizes this ripening process). Prior to the start of the innovation contest, the contest was advertised by posters and emails. The registration was opened by handing out a stress ball in apple shape including a flyer as little teaser present to every Zimmer GmbH employee. People could initially register alone or as a team, and team assembling took place at the kick-off event for the individually registered participants. Subsequently, team-building workshops took place and all participants were introduced to current strategic priorities and needs of the company. Also, the contest rules were introduced during the kick-off meeting, which are summarized in Figure 3.

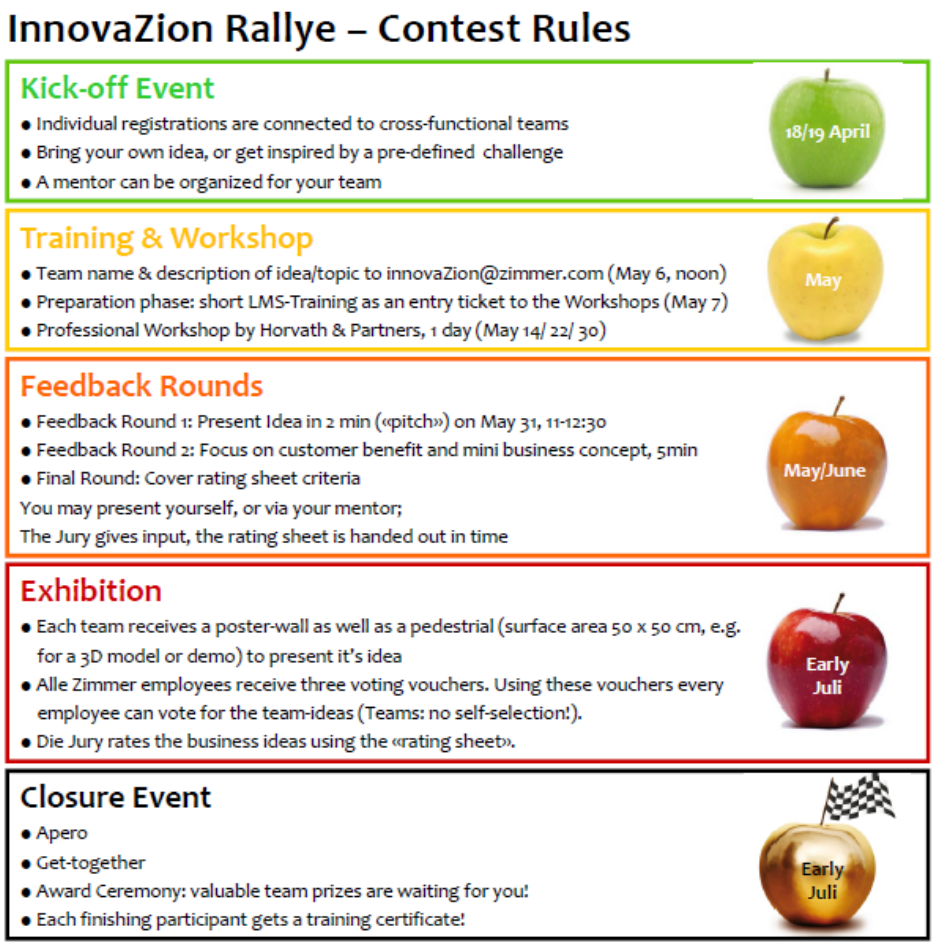

Figure 3: Innovazion rallye contest rules

While the figure above illustrates the official contest rules, the following paragraphs summarize and explain the underlying rationales that led to the creation of the contest rules above.

Kick-off Event

The rating criteria (refer to chapter 4.3) were communicated in the very beginning of the InnovaZion Rallye during the Kick-off meeting. This has the advantage that the rating process is transparent, and implies fairness and justice (Hart et al., 2003). Moreover, it helps the innovation teams to understand the expectations and the strategy better (Englund & Graham, 1999), which improves their delivery quality (Cooper & Kleinschmidt, 2007). The strategy of management and the current needs and opportunities were communicated right at the Kick-off meeting to the participating teams. This happened due to the importance of strategy communication for performance which was highlighted by Cooper and Kleinschmidt (2007).

Training and Workshops

An online-training as well as a one-day workshop session was conducted by the teams during the innovation process. The workshop session was supported by Horváth & Partner AG (Jörg Schönhärl) and included a problem definition part, several creativity techniques as well as a workshop using the rating criteria. The importance of customer focus throughout the entire innovation process (Cooper & Kleinschmidt, 2007; Carbonell-Foulquié, 2004) was communicated to the teams and applied to the ideas by means of a user benefit analysis. The intend of the workshop was to take a first step in letting the team ideas 'ripen' to enrich the idea quality. In the current internal contest, amongst others, ideas with internal value (e.g. process efficiency ideas) were expected, and therefore the wording 'user benefit' was consistently used, which includes both internal and external customers who can benefit from the idea.

Feedback Rounds

The jury, consisting of a cross-functional management team, was assembled in a meeting room and teams presented their ideas one by one. The jury was asked to give feedback on each of the ideas and propose relevant contacts that may help the teams to elaborate their ideas (feedback round 1). A second feedback round was done via email communication where the jury already provided detailed feedback on how they would assess the rating criteria (feedback round 2) so that the teams had input to further develop and enrich their ideas towards project proposals. Feedback round 3 was the final project proposal evaluation during the exhibition and closure event and the data extracted thereby represents the basis for the current study.

Exhibition and Closure Event

The exhibition and the closure event gave the teams the opportunity to increase awareness to their project proposals throughout the entire enterprise to enhance realization likelihood and team recognition. Employees from all departments were invited to visit the exhibition and vote on the ideas using little chips to select an 'audience winner'. In addition, they were asked whether they would answer the full questionnaire of the current study (refer to chapter 4.3) for each team proposal. The jury visited the exhibition as well, and teams explained their proposals, upon which the managers answered the questions of the current study for each team proposal and selected a 'jury winner'. Finally, prizes and awards were handed out as a closure of the innovaZion competition and follow-up sessions on the team proposals were scheduled.

4.3. Rating Criteria and Rating Sheet

Following previous research as summarized in chapter 3.2, three global rating criteria were identified namely ***novelty***, ***feasibility*** and ***user benefit***. Figure 4 illustrates an overview on the selected rating criteria for this study including the specific questions asked. ***Quality of idea description*** was used as a control variable in this study, to control for information effects. If the rating person did not understand an idea well, this would become apparent by the rating of this control variable. The variable quality of idea description might also be related to some extend to the fourth rating criterion as identified by Blohm et al. (2011) called 'elaboration'. If the idea is well elaborated and presented by the teams, it is likely that the rating person understands the idea and its concept which is the question behind the rating criterion quality of idea description of the current study. A five point scale was used to assess the four criteria novelty, feasibility, user benefit and idea description quality, where '1' indicated a low score and '5' indicated a high score of the recarded criterion. This rating scale was chosen for the analysis because it is a widely accepted scale which is likely to be familiar to people participating in the study.

In addition, the participants were asked whether the company should invest into each of the rated ideas being selected for further investigation. A two-stage response was chosen, in order to be close to a relevant practical implication where managers have to make clear investment decisions at certain gates within the innovation process. A 'go' indicated a positive investment decision and a 'no go' indicated a negative investment decision. The go/ no go decision should be as independent as possible from the other ratings, and therefore it was listed first.

0. GO/ NO GO	
Shall the company invest into this idea being selected for further investigation = funded pilot/ feasibility project?	**GO/ NO GO**
Please briefly describe why you gave the idea a go / no go.	
1. Novelty	
How novel is this idea compared with existing solutions available? To which extent does this idea reflect a truly unique approach?	**(1,2,3,4,5)**
2. Feasibility	
How easily could the concept be successfully realized into a feasible solution? - consider Technical, Economic, Legal, Operational, and Scheduling Feasibility	**(1,2,3,4,5)**
3. User Benefit	
To which extent can this idea address a relevant user need? User = (potential) customer for Comm & Service Exc. or internal user for Quality & Process/People Exc.	**(1,2,3,4,5)**
4. Quality of Idea Description	
How well did you understand the described idea and the concept behind the idea?	**(1,2,3,4,5)**

Figure 4: Rating sheet used for the current study

4.4. Idea Evaluation Process

All employees of Zimmer GmbH in Winterthur were invited to visit the innovaZion exhibition, where each of the 11 finalizing teams had a poster wall as well as a pedestal to display their project proposals. We recommended to the teams that minimum one team member is in charge of explaining their ideas during all opening times, which was also followed by the teams. Visiting employees were motivated to ask questions to the exhibitors to get the complete information about the project proposals. They were able to contribute to the idea selection in two different ways, namely the extended crowd voting and the employee evaluation (small crowd).

Extended Crowd Voting (Employees)

All employees who visited the innovaZion exhibition (n=280) received three voting coupons. Each of the eleven stands had a construction where these voting coupons could be inserted. A visitor could give three chips to a top favorite team proposal or distribute the chips over several favored team proposals as the visitor deemed appropriate. No clear instructions were given to the visitors, and it was made clear to them that a price will be handed out to the team with the majority of the votes. Therefore, motives such as sympathy or purely personal preference are not excluded from the results of this voting method. The eleven constructions accommodating the voting coupons were designed in a way that visitors could not see the number of previous votes for the presenting teams, in order to prevent biases by selections of previous visitors.

Employee Evaluation (Small Crowd)

Most of the employees were also asked to fill out the rating sheet which was introduced in chapter 4.3. The rating sheet was briefly explained to them and they were informed that the completeness of their evaluations was important. Filling out the rating sheet was non obligatory for visiting the exhibition and independent of the winner selections, so intended solely for the purpose of this thesis. This was important to assure that the evaluators were rating the ideas rather than helping sympathized teams to win a prize. No name was requested on the rating sheets which allowed them to submit the rating sheets without giving their identity in order to prevent biasing effects.

Management Evaluation

The jury members were part of the creation of the rating sheet and the rating sheet was well discussed upfront, therefore no additional training was required to train the jury on how the rating criteria must be understood. The jury members were asked to go through the idea exhibition. Additionally, they were informed on the project proposals by the teams via an 8 minute presentation of the project proposals after which there was a short

time period to ask remaining questions. Each jury member was asked to take notes and to start filling in the rating sheet (refer to Figure 4) on an individual basis while listening to the team presentations. They had the possibility to ask questions to the teams to make sure the team concepts were well understood. Afterwards, the participants left the exhibition and the jury had time to discuss relevant arguments, concerns and other aspects of the presented proposals and they had a possibility to change their own ratings.

Management Preference Selection

Similar ideas were grouped in agreement with the jury into different categories to enable better comparisons. The grouping was done retrospectively to the rating sheet evaluations but prior to the selection of preference ideas. The resulted grouping of the ideas was five process excellence ideas, four communication excellence ideas and two technology excellence ideas. Within each of the groups, the jury identified the project with the highest potential, taking their rating criteria as well as arguments that were exchanged in between the jury members into account. The top team was team B for communication excellence, team C for process excellence and team I for technology excellence. This approach reduced the complexity in order to execute a vote of their favorite idea overall. Amongst these three top projects within each category, each of the jury members (n=9) selected one favorite from which they personally believed it would have the highest impact and benefit for Zimmer GmbH.

4.5. Data Selection

Incomplete rating sheets were excluded from the analysis in favor of appropriate relative comparisons and conclusions. It was not seen favorable to use rating sheets where an evaluator rated only a minority of the ideas presented, e.g. those that were of his particular interest. Rating of only a few selected ideas would make the distribution of go/ no go decisions less conclusive and meaningful. Therefore only rating sheets where all questions had been answered for the majority of the ideas (minimum 10 out of 11 full idea ratings)

were used for the analysis. This left 16 rating sheets from the visitor rating and 8 rating sheets for the jury rating. An exception was the data used for the analysis of the favorite amongst the 'top three' project proposals (chapter 0), where nine jury rating sheets were used instead of eight because one additional sheet was complete and meaningful for this specific comparison.

4.6. Description of the Sample: Idea Evaluators

The jury members (managers) were typically on director level and above and they were from marketing and sales, research and development, quality, manufacturing and legal. An IT expert was also consulted during the idea evaluation process. The jury members were representative of the Zimmer GmbH management, typically from the top levels of the major departments.

The identity of the employees who filled out the rating sheets remained anonymous and is therefore unknown. Principally, all employees visiting the exhibition (n=280) were free to answer the study questions for each of the teams using the preliminarily prepared rating sheet. While about 30 rating sheets were handed in, only 16 of those were complete enough and useful as defined in the previous chapter. Therefore, the employees of the current sample may not well represent all Zimmer employees. Firstly, only about 10% of all visitors of the exhibition filled out the rating sheets, and secondly, only half of the submitted rating sheets were complete enough to be meaningful. Selection biases are therefore likely for the employee evaluation data, because firstly, the regarded sample may be especially engaged or related with the innovation contest to take the time for a more time intensive evaluation, and secondly, the regarded sample of evaluators may have been especially thorough in order to submit a complete and meaningful rating sheet.

4.7. Statistical Comparisons Overview

Analyses were first made on proposal level (chapter 5.2), comparing the average novelty, feasibility and user benefit ratings to the amount of go/ no go decisions per proposal. Using the average novelty of each proposal may be more representative of the true mean of each proposal rather than using the perceived novelty ratings of each individual. These comparisons shall give insight into whether novel proposals are preferably accepted (go) or rejected (no go) and how manager ratings compare to employee ratings.

Subsequently in chapter 5.2 the perceived ratings of novelty, feasibility and user benefit were related to the subsequent go/ no go decision by relating the perceived criteria ratings of each single proposal rating of each single person to the related go/ no go decisions (chapter 5.3). This approach allows more in-depth analyses how specific perceptions of the proposal influence the resulting investment decision, and allows also investigation of interdependencies between the perceived rating criteria novelty, feasibility and user benefit with respect to the resulting investment decisions. Also category-specific prioritization of rating criteria for the related investment decisions in different categories (communication excellence, process excellence and technology excellence) is regarded.

Chapter 0 investigates a similar comparison where the preference idea is taken instead of the go/ no go decision (jury only).

Statistics on Proposal Basis (results in chapter 5.2)

The purpose of the statistics on proposal basis was to evaluate how highly novel ideas are supported by different rating groups. To start with, a descriptive overview was provided comparing the manager ratings to the employee ratings and Anova comparisons were used to test the differences between the rating groups for statistical significance.

Next, the results of the employee evaluation (small crowd), the management evaluation and the extended crowd employee voting were plotted to provide an overview. Ideas were

sorted by decreasing average novelty of the pooled management and employee ratings for novelty. Average feasibility and user benefit ratings were displayed as well. Below each proposal (A through K), the relative fraction of 'go' decisions of managers and employees were symbolized by the green part of a pie chart, the 'no go' fraction by the red part of the respective pie charts. The green fraction of the extended crowd employee vote indicates the relative number of votes for the regarded proposal in comparison with the idea which received most votes, which was idea B. Idea B received a total of 149 votes, so assuming for example another proposal received a total of 15 votes, then the green fraction of the pie chart would correspond to 10%.

Moreover, a chi-squared analysis was performed comparing the go and no go decisions of highly novel versus lowly novel ideas. The fields for chi-squared statistics were high novelty, low novelty on one dimension and go, no go on the other dimension resulting in four fields for each rating group. In order to prepare the data for chi squared statistics, proposals with the related novelty ratings (managers and employees pooled) averaging to a number smaller than three (<3) were separated from proposals with high novelty ratings (>3). Three different chi-squared analyses were performed, each one analysis for the employee evaluation, the management evaluation and the extended crowd employee voting. The separation of the data in the dimension go versus no go could simply count the amount of go decisions versus the count of no go decision for the employee evaluation and the management evaluation. For the extended crowd employees, go/ no go data was not available, and therefore it was assumed that proposals that received less than 75 votes, which is the number of votes that could be expected if all 828 votes were distributed uniformly amongst the eleven teams, would be less preferred and overall rather be comparable to a 'no go'. On the other side, proposals receiving more than 75 votes would rather be comparable to an overall 'go'. The extended crowd data has only 11 counts in total, namely one 'decision' per proposal, and consequently by default less than five counts in at least one of the four fields. As a consequence, the chi-squared statistic is not very robust for the extended crowd, but trends can be recognized and compared to the results of the management and employee evaluations.

Statistics on The Perceived Criteria (results in chapter 5.3)

The statistics on perceived rating criteria basis used data of each person's rating of each idea in direct relation to the related go/ no go decision. Simple plots were used showing the count of 'go' decisions as green bars and 'no go' decisions as red bars to provide an overview of the results. Mean and median novelty results were compared as well between all 'go' decisions and all 'no go' decisions. Subsequently, a regression analyses investigated the effect of novelty on the go/ no go decision under consideration of other relevant factors such as feasibility, user benefit and idea description as well as rating group. The regressions analyze the data of 16 employees plus 8 managers, each of them rated 11 ideas. The number of observations of the regression analysis relating the individually perceived novelty to the resulting go/ no go decision has therefore basically 24x11=264 observations. Secondly, regression analyses were performed for the different categories communication excellence, process excellence and technology excellence separately. This means basically 24x4=96 observations for communication excellence (4 ideas), 24x5=120 observations for process excellence (5 ideas) and 24x2=48 observations (2 ideas) for technology excellence respectively. While the total number of observations is indeed high, the data of the observations would only be truly randomized if for example 264 independent people rate each one of the ideas. Nevertheless, the regression analyses are meaningful to show dominant effects as well as direction and magnitude of the coefficients of the predictor variables. Interactions or dependencies between novelty and the other rating criteria were analyzed using different descriptive regression plots as well as descriptive cross-tabulations. The descriptive cross-tabulations summarize both the counts of overall decisions (go + no go decisions) and the relative percentage of 'go' decisions. The relative percentage of 'go' decisions was calculated using the following formula: $relative\ 'go'\ percentage\ (\%) = \frac{count\ of\ 'go'\ decisions}{count\ of\ 'go'\ decisions + count\ of\ 'no\ go'\ decisions}$

Chi-square statistics was not applicable because the counts of 'go' had to be relativized to the overall decisions made in each field in order to be meaningful.

Descriptive Statistics in General (results amongst others in chapter 0)

T-tests were controlled for equal variance, in case of unequal variances a t-test with unequal variances (t-test, unequal σ) was applied, else a t-test with equal variances (t-test, equal σ). In cases of uncertainty of the distribution, it was additionally checked whether a Mann-Whitney U test would lead to the same conclusion. Anovas were followed by Tukey-corrected pairwise comparisons if pairwise comparisons were of interest. All statistical analyses were executed using the Minitab Inc. software.

5. RESULTS

5.1. Results Overview

The comparisons on proposal level revealed that the proposal assessments using the rating criteria novelty, feasibility and user benefit were consistent between managers and employees. Descriptive plots indicated a pro-novelty trend that was confirmed by the subsequent chi-squared statistics, which showed that the stronger preference of the most novel ideas was significant for both the employee's and manager's go/ no go decisions and also for the extended employee vote.

The comparisons which related perceived novelty to the investment decisions confirmed a pro novelty trend both via descriptive statistics and regression models. Also perceived feasibility and user benefit were positively related to the respective investment decisions. While high perceived user benefit was independently associated with positive investment decisions, several interaction effects between novelty and feasibility were shown. In a high fraction of cases, proposals were perceived as both novel and feasible. While proposals that were perceived as both novel and feasible had the highest chance for a positive investment decisions, also *either* novel *or* feasible proposals had high fractions of associated positive investment decisions. Moreover the proposal categories had distinct evaluation patterns. The dominant decision factor within communication excellence was user benefit, within technology excellence it was novelty, and within process excellence it was feasibility.

Selection of top favorite ideas during the jury rating process revealed a mixed, about half-half, preference of the highly feasible top proposal vs. the highly novel top proposal.

The following chapters provide the details behind the above summarized results.

5.2. Comparisons on Proposal Level

Rating Criteria Assessment by Managers and Employees

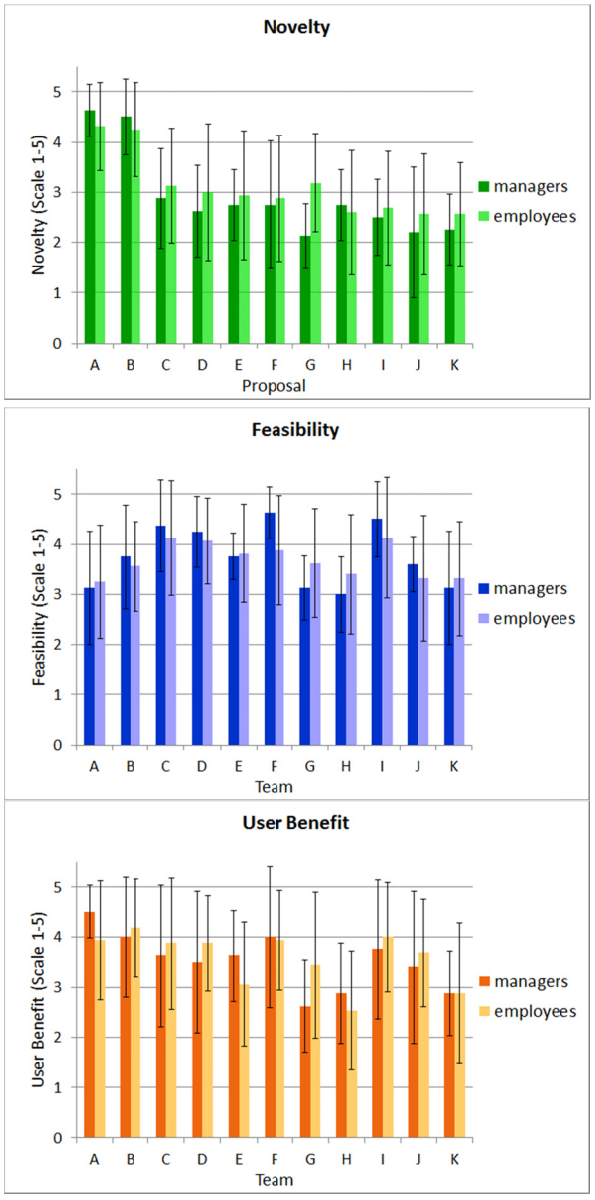

Figure 5: Jury vs. visitor rating of the different proposals

An overview on the novelty, feasibility and user benefit ratings is plotted in Figure 5. In general, the average and standard deviations of the rating criteria novelty, feasibility and user benefit as rated by the jury versus the employees are very consistent for the respective proposals. A general linear model accounting for the factors *rating group*, *proposal* and their interaction revealed no significant influence of *rating group* neither on the resulting novelty, feasibility nor user benefit ($p_{\text{rating group, novelty}}=0.199$, $p_{\text{rating group, feasibility}}=0.675$, $p_{\text{rating group, user benefit}}=0.832$). The influence of the factor *proposal* was significant for both novelty, feasibility and user benefit ($p<0.001$ for all three criteria). The interaction *rating group* * *proposal* was not significant for neither novelty, feasibility nor user benefit ($p_{\text{interaction, novelty}}=0.704$, $p_{\text{interaction, feasibility}}=0.647$

and $p_{interaction,\ user\ benefit} = 0.687$). These very consistent findings undermine the strong agreement between the rating criteria as assessed by the managers and the employees on proposal basis.

Descriptive Analyses of the Decisions on Proposals Basis

The proposals were sorted by their novelty as rated by the rating persons and named in alphabetical order, meaning that idea A had the highest average novelty rating and idea K the lowest average novelty rating.

The overview given in Figure 6 uses the average of both evaluator groups pooled to plot the criteria novelty, feasibility and user benefit. It shows the technology and process excellence proposals, whereby ideas A and B refer to the two technology excellence ideas.

The go/ no go decisions of the managers showed that they were in favor of all process and technology proposals as indicated by their uniform 'go' decisions illustrated by a fully green pie chart, which would mean that 8 out of 8 managers decided for a 'go'. Only for the least novel proposal 'no go' was part of the decisions.

The employee evaluation showed a trend of more relative 'go' decisions for the more novel ideas, but also feasibility seemed to affect the results: Proposals A and B were rated as the most novel proposals and got 14 'go' decisions and two 'no go' decisions which is visualized by a pie chart in green color. The remaining 12.5% (2 out of 16) is indicated filled by a red color in the pie chart symbolizing the fraction of 'no go' decisions. Proposals C and D which are less novel but in the same time clearly more feasible got even 15 out of 16 'go' decisions. The three least novel proposals got more relative 'no go' decisions. Proposals F and I had a higher user benefit and comparable feasibility compared to ideas C and D, and yet they received more 'no go' decisions than the more novel ideas C and D. The descriptive results therefore do not indicate a bias against novelty, but rather a pro-novelty proposal evaluation behavior.

Within the extended employee voting the second most novel proposal (B) received the highest number of overall votes, namely 149 out of 828 total votes which is indicated by a fully green pie chart (refer to chapter 4.7 for details). Proposal B scored high in both novelty, user benefit and feasibility with the highest sum of those criteria compared to the other proposals. In overall, the results of the extended employee voting showed more preferences of the three novel proposals A, B and C and the least novel idea I while ideas D F and I with medium-low novelty received less votes. No systematic pattern with respect to the three criteria can be recognized which may indicate that other factors influenced this rating as well.

Overall, the results did not confirm a negative bias against novel ideas. While there seems to be a pro novelty trend, the significance of such a trend remains inconclusive based on the descriptive plots only.

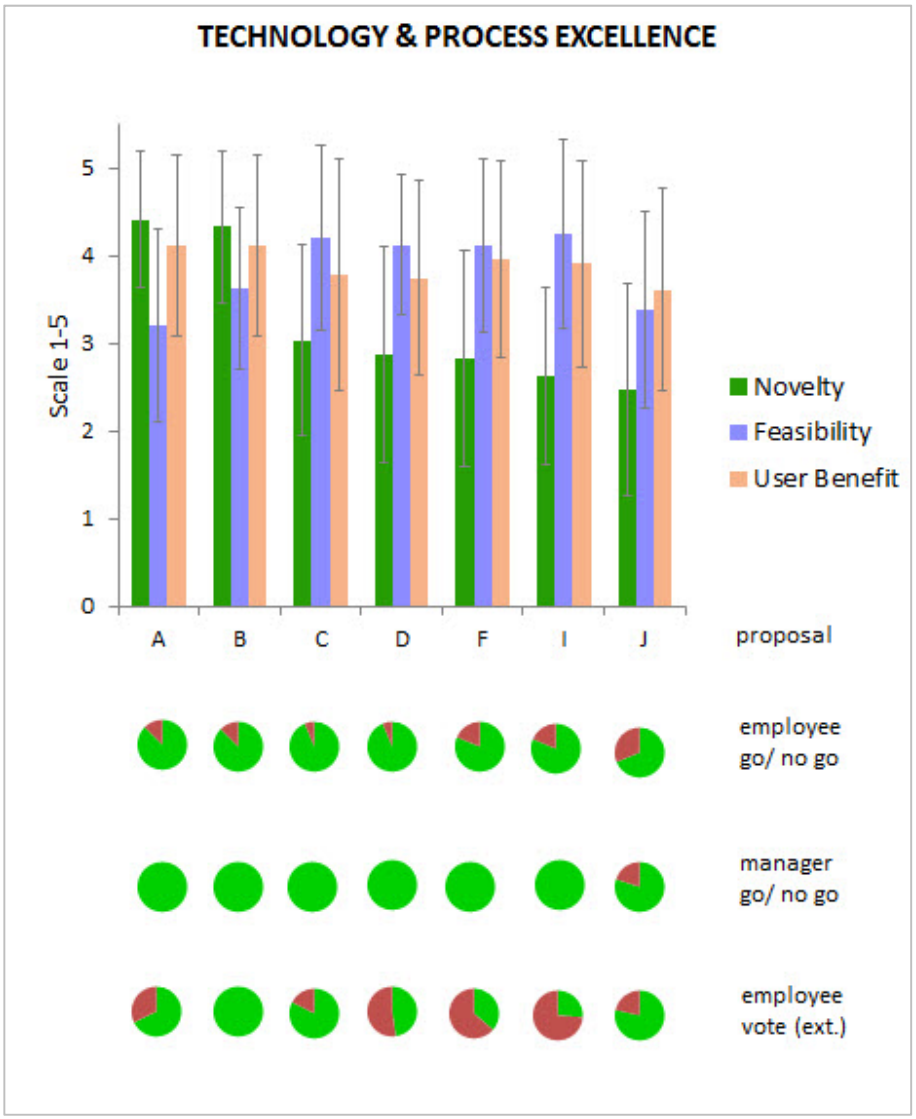

Figure 6: Overview of the rating results for the technology and process excellence ideas. Ideas are sorted by decreasing average novelty of the pooled management and employee ratings for novelty; feasibility and user benefit ratings are displayed as well. The relative fraction of 'go' decisions of managers and employees are symbolized by the green part, the 'no go' fraction by the red part of the respective pie charts. The green fraction of the extended crowd employee vote indicates the relative number of votes in comparison with the idea which received most votes (idea B).

The communication excellence ideas were displayed in a separate chart (Figure 7), because the rating pattern deferred significantly. User benefit and feasibility of those ideas was clearly lower compared to the technology and process excellence ideas, and the amount of 'go' choices was clearly lower as well for both employee decisions and jury decisions, which becomes evident if Figure 7 and Figure 8 are compared. Employees preferred rather idea G and the jury preferred rather idea F, which may be explained by the original differences in the ratings of novelty, feasibility and user benefit between jury and management in the case of idea G (refer to Figure 5).

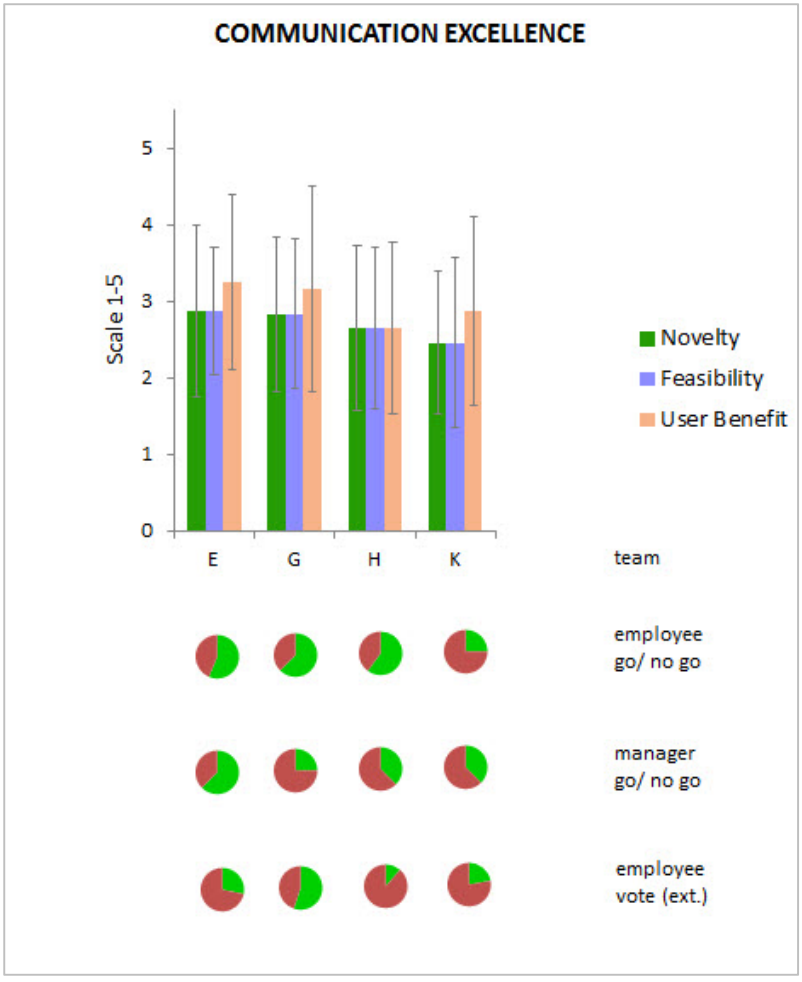

Figure 7: Overview of the rating results for the communication excellence ideas. Display principle identical to Figure 6.

Effect of Novelty: Rating Result Statistics on Proposal Basis

Chi-square statistics indicated a significant divergence between the data's distribution and the expected distribution in favor of the novel proposals for both the employee rating (p=0.002), the jury rating (p=0.001) and the extended crowd employee rating (p=0.026). Table 1 shows that the values in the downer right corner, which is the field of positive decisions on highly novel proposals, were higher than expected values in brackets for both the employee evaluation, the manager evaluation and the extended crowd voting. The details of the methods underlying the chi squared statistics display in Table 1 were described in chapter 4.7. The downer left corner of each matrix, indicating negative reactions on highly novel ideas, was consistently lower than the expected values in brackets as calculated by the chi squared statistics approach for all rating groups, which indicates a pro novelty evaluation pattern. The low novelty proposals received less go and more no go decisions accordingly compared to the calculated expectation values.

Therefore, the analyses suggest a significant pro-novelty behavior of all rating groups on proposal level.

Table 1: Cross-tabulation of the decision results of different rating groups on proposal basis. Actual counts: bold numbers. Expected chi-square values: plain numbers in brackets.

	Employees		**Managers**		**Extended Crowd**	
	NO GO	GO	NO GO	GO	few votes (<75)	many votes (>75)
low novelty proposals (average<3)	**43** (35)	**84** (92)	**20** (14)	**41** (47)	**6** (4.4)	**2** (3.6)
high novelty proposals (average>3)	**5** (13)	**43** (35)	**0** (6)	**24** (18)	**0** (1.6)	**3** (1.4)

5.3. Perceived Novelty and its Effect on the Investment Decision

Overall, all proposals that were perceived by one rating person as being very novel (novelty rating = 5) were granted a 'go' decision by the very same rating person, as illustrated in Figure 8. The fraction of 'no go' decisions of the visitors increased with decreasing novelty over all idea types pooled, suggesting a pro-novelty tendency of both managers and employees.

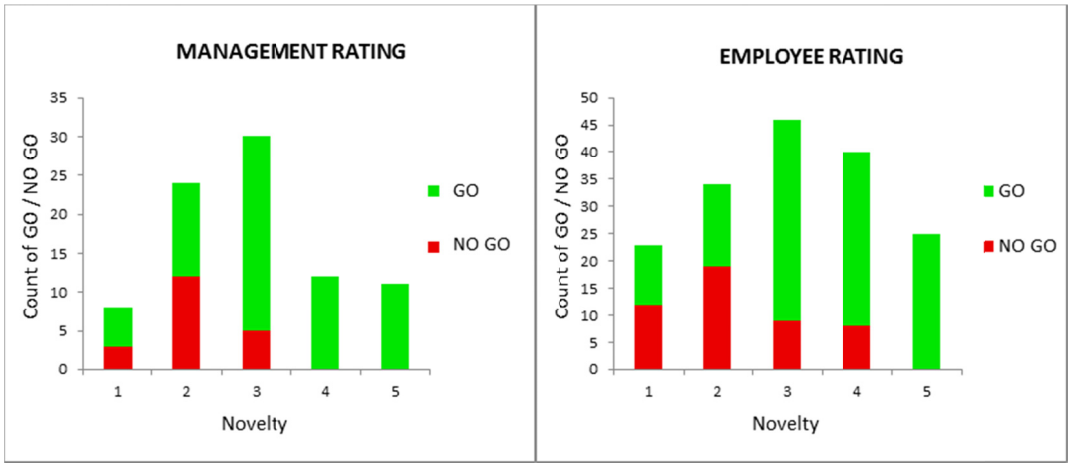

Figure 8: Fraction of go/no go decisions as a function of perceived novelty: rated by management (left) and the employees (right)

The 'go' decisions had both a significantly higher novelty rating mean ($p<0.001$, t-test) and a significantly higher median ($p<0.001$, Mann-Whitney U test) compared to the 'no go' decision, which was true both for the employee rating and the management rating. However as indicated by the star symbols of the boxplot in Figure 9 of the 'go' decisions for a rated novelty of '1', it appears that selected low novelty ideas have a chance of receiving 'go' decisions as well.

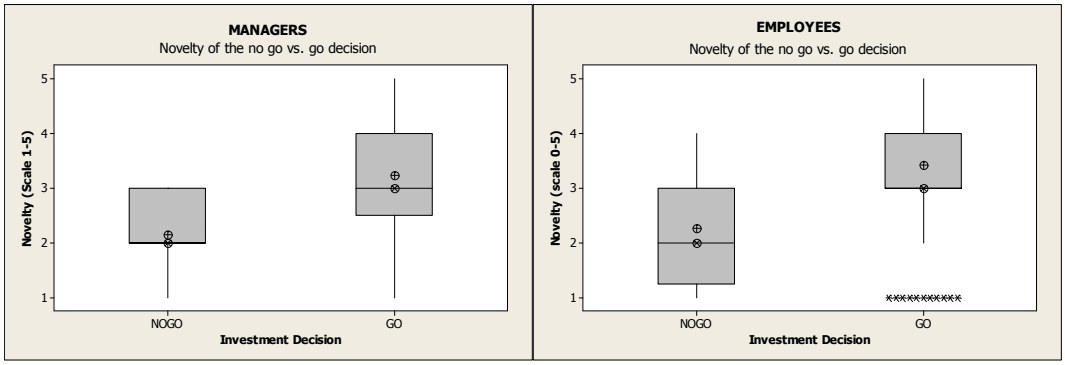

Figure 9: Boxplot of the novelty results for a go vs. no go decision: management rating (left) and employee rating (right)

Because the simplified comparisons above do not consider other relevant factors that may influence the go/ no go decisions, e.g. what other factors may have contributed to 'go' decisions for the low novelty ideas (star symbols), a general linear model was used to see general potential influencing factors that should be considered in a further in-depth analysis.

The results of the regression analysis (Table 2) showed that both the factors novelty ($p=0.004$), feasibility ($p<0.001$), user benefit ($p<0.001$) and idea description ($p<0.001$) had a significant influence on the go/ no go decision, as well as the effect of rating group ($p=0.023$). The influence of novelty, feasibility, user benefit and idea description had a positive direction.

Table 2: Coefficients and details from the regression analysis considering all relevant factors influencing the investment decision (go/ no go)

Independent Variables	Correlation Coefficients
Novelty	0.05**
Feasibility	0.11**
User Benefit	0.11**
Idea Description	0.12**
Rating Group	0.10*
R^2	0.52**

*** = p<0.05; ** = p<0.01**

Category-Specific Observations

Correlation analyses were repeated for the three categories communication excellence, process excellence and technology excellence separately. Within communication excellence, only user benefit had a significant effect on the go/ no go decisions ($p<0.001$). Within process excellence, the dominant effect was feasibility ($p<0.001$) but also the effect of novelty ($p=0.022$) was significant. For technology excellence ideas, only the factor novelty ($p=0.002$) was significant. The control variable idea description was included in the regression model and was significant for communication and process excellence as well.

The dominant decision factor as indicated by the coefficient and its significance level (compare Table 3) was user benefit within communication excellence, novelty within technology excellence, and within process excellence it was feasibility.

Table 3: Coefficients and details from the regression analysis relating rating criteria to the investment decision (go/ no go) for the categories separately

Independent Variables	Communication Excellence	Process Excellence	Technology Excellence
	Correlation Coefficients		
Novelty	0.04	0.05*	0.14**
Feasibility	0.05	0.16**	0.05
User Benefit	0.19**	0.02	0.05
Idea Description	0.12**	0.09**	0.08
R^2	0.52**	0.51**	0.40**

*** = p<0.05; ** = p<0.01**

Interactions and dependencies between different rating criteria

The effect of novelty on the go/ no go decision was plotted for different feasibility levels and different user benefit levels. The positive effect of novelty was strongest for proposals with medium to low ratings (two or three) of feasibility and user benefit respectively, as indicated by the green and red steep lines in *Figure 10*. Just if feasibility and user benefit were too low (rating 1), novelty did not change the decision any more in positive direction (refer to black lines in *Figure 10*). Especially when user benefit was already rated high (four or five, yellow and blue line in *Figure 10*), in many cases evaluators already decided for a 'go' and the curve was already close to one even for lowly novel ideas, indicating that the effect of novelty had less impact.

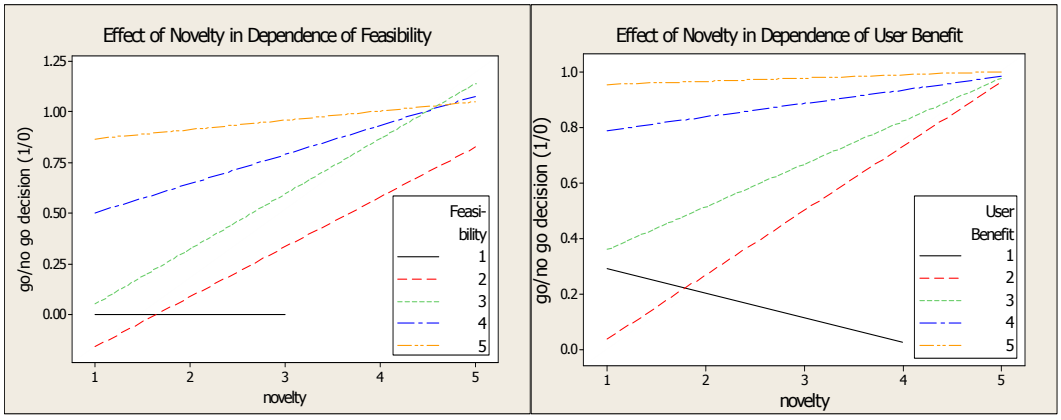

Figure 10: The effect of novelty on the go/ no go decision, plotted for different levels of feasibility and user benefit separately

The following cross-tabulations summarize both the counts of 'go' decisions and the relative percentage of 'go' decisions. The count of go decisions is referring to 'n' observations in this field, and the relative percentage is based on dividing the count of 'go' decisions by the count of the overall decisions made (refer to chapter 4.7). As an example, in the field of high feasibility and medium novelty in Table 4, a relative percentage of 96 % and a count of n=49 means that out of 49 total decisions made, 96% were 'go' decisions and accordingly 4% were 'no go' decisions.

Novelty Versus Feasibility Cross-Tabulation

Investment decisions were related to the directly related perceived novelty and feasibility of the rated criteria, which were classified as low (1, 2), medium (3) or high (4, 5) in Table 4. Gradual conditional formatting was used to illustrate the relative percentage of 'go' decisions for each field (lowest value = red, 50 percentile = yellow and highest value = green). Generally, both high novelty and high feasibility influenced the related investment decision positively. Proposals did not need to be high in both novelty and feasibility in order to receive a majority of 'go' decisions: If one of the two criteria was high and the other criterion average, this was enough to convince nearly all evaluators for a 'go' decision.

The current results show that 56 cases were rated as both novel and feasible, whereas only 16 cases were rated as novel but not feasible. A subsequent correlation analyses confirmed a non-significant correlation between novelty and feasibility (r= -0.008; p=0.908). Those findings combined indicate that if novelty of an idea was perceived to be high, the idea could be perceived to be highly feasible in the same time.

Highly feasible ideas with low novelty were granted a 'go' decision in 68% of the cases, which confirms the assumption that people tend to prefer familiar ideas (refer to chapter 3.4). But also for proposals which were perceived as highly novel but lowly feasible, the respective evaluator suggested that the company invests in the proposal in 69% of the cases (11 out of 16 cases). The five no go decisions in this cell came from employees, the 11 'go' decisions were in seven cases made by employees, and in four cases by managers. The related user benefit was significantly higher for those eleven proposals that received 'go' decisions (4.0 ± 1.0) than for the remaining five 'no go' decisions (2.4 ± 0.9) (t-test equal σ; p=0.009). Consequently, proposals that were rated as highly novel and lowly feasible received 'go' decisions by both managers and employees in 69% of the cases, and those 'go' decisions and had significantly higher user benefit ratings than the 31% 'no go' decisions.

Table 4: Cross-tabulation of the relative percentage of go decisions (bold) and the number of ratings per category (in brackets), separated by feasibility and novelty

		Feasibility		
		Low	Medium	high
Novelty	Low	**7%** (n=15)	**13%** (n=15)	**68%** (n=59)
	medium	**11%** (n=9)	**79%** (n=19)	**96%** (n=49)
	High	**69%** (n=16)	**95%** (n=22)	**96%** (n=56)

Novelty Versus User Benefit Cross-Tabulation

High user benefit ratings were associated with a high relative occurrence of 'go' decisions, as evident from Table 5, with only a small effect of novelty. Highly novel ideas were supported by a 'go' decision almost certainly when user benefit was high as well, and the chance for getting a 'go' when user benefit was low or medium was around 60%. Highly rated novelty, with medium to low user benefit only, therefore led to a decrease in the relative percentage of 'go' decisions. On the other hand, highly rated user benefit consistently scored high in 'go' decisions, almost independently of the associated novelty ratings.

Table 5: Cross-tabulation of the relative percentage of go decisions (bold) and the number of ratings per category (in brackets), separated by user benefit and novelty

		User Benefit		
		low	Medium	high
Novelty	low	24% (n=41)	35% (n=17)	87% (n=31)
	medium	25% (n=8)	84% (n=32)	92% (n=37)
	high	60% (n=5)	58% (n=12)	99% (n=77)

Feasibility Versus User Benefit Cross-Tabulation

For ideas that had a medium or low user benefit, feasibility consistently increased the chance for a 'go' decision. For proposals that were considered of high user benefit, generally the chance for 'go' decisions was also high. Focusing on those few cases (8 out of 145) where proposals were discarded with a 'no go' despite of the high user benefit, those ideas were both significantly less novel ($p=0.012$; t-test unequal σ) and significantly less feasible ($p>0.001$; t-test unequal σ).

Table 6: Cross-tabulation of the relative percentage of go decisions (bold) and the number of ratings per category (in brackets), separated by feasibility and user benefit

		User Benefit		
		low	medium	high
Feasibility	low	5% (n=5)	27% (n=27)	100% (n=100)
	medium	33% (n=33)	57% (n=57)	78% (n=78)
	high	42% (n=42)	86% (n=86)	99% (n=99)

5.4. Novelty of the Favorite Amongst 'Top Three' Projects

As introduced in chapter 4.4, the top proposals as pre-selected by the jury were proposal A for technology excellence, proposal F for process excellence and proposal E for communication excellence. The jury members (n=9) used each one vote to select their favorite proposal amongst those three top proposals.

Proposal A had the highest novelty ($p<0.001$; confirmed by tukey-corrected pairwise comparisons) and proposal F had the highest feasibility ($p<0.001$; confirmed by tukey-corrected pairwise comparisons) and the user benefit was comparable amongst all proposals ($p=0.248$).

Proposal E got no votes as favorite idea, being comparable in user benefit to the other two ideas, but neither outstanding in novelty nor feasibility. Proposal F had the significantly highest feasibility results and no outstanding novelty result, and it got 44% (four votes) of the selections as favorite idea. Proposal A had the significantly highest novelty results and no outstanding feasibility result, and it got 56% (five votes) of the selections as favorite idea.

In summary, about half of the jury members selected the proposal with a high novelty as their favorite proposal (five votes) and about half of the jury members selected the proposal with high feasibility as their favorite proposal (four votes), given a comparable user benefit. No votes were given to the proposal being comparable in user benefit to the other two proposals, but not outstanding in terms of neither novelty nor feasibility.

6. DISCUSSION

6.1. The Role of Novelty

On a first glance, the positive influence of novelty on the go/ no go decision (pro-novelty behavior) may contradict that of previous studies. Several arguments may explain the observed novelty behavior

- Employees and managers ***expected*** to see innovations and novel ideas, so they were coming to see novel ideas. The name innovaZion already implied that novel ideas will be exhibited and therefore visitors, who are looking for novel ideas, may have been attracted to visit the exhibition already in the first place. A selection bias of pro-novelty oriented individuals was therefore possible.

- There are some results in this study supporting the hypothesis that preference of novelty may ***vary on an individual level***, either attributable to a novelty-seeking characteristic (refer to chapter 3.3) or to strategic considerations. Especially when managers had to choose their favorite idea, five out of nine managers were clearly pro-novelty oriented (indicated by both their favorite choice and their comments), and the remaining four managers were more convinced of the idea showing clear feasibility. No distinction can be made in the current study whether the different preferences are a result of different novelty-seeking characteristics or strategic considerations. However, data such as created by the current study as well as the general use of rating criteria could help to make unconscious processes more conscious.

- It may be argued that the ideas investigated in this study are simply ***not unfamiliar or 'novel enough'***. It was postulated earlier that employees may not have as much access to information that is further apart as for example users (Kristensson et al., 2004) and consequently employees may create ideas that are not necessarily radically novel. The proposals presented in the current contest could still be well understood with good supply side knowledge, they were not from distant markets and could therefore be well related to, which is also evident in the answers to the question how well participants understood the idea (question behind 'idea description'). This could be a potential explanation why the rating persons of the current study did not show a negative reaction to novel ideas. So is there a threshold of novelty after which an anti-novelty behavior becomes apparent? Is there an 'optimum' of novelty to which people respond favorably? This would indicate that the relationship between 'go' decisions and novelty would rather look like an inverted U-curve if more radical ideas were included. To clarify this issue, more evidence remains to be collected.

- There were several crucial differences between the current study and the study by Boudreau et al. (2012) which found an anti-novelty bias. The novelty assessment was different on the one hand (Boudreau: comparing term combinations of a proposal with those term combinations in the existing published literature; current study: perceived novelty-rating assessed by the raters), and the question behind the measure for the dependent variable was different on the other hand (Boudreau: 'impact on (the disease) care, patients, or science of research'/ 'merit of the proposals' (validation measure); current study: 'Should the company invest into this idea being selected for further investigation = funded pilot/ feasibility project?'). Another difference was the context of the rating context, namely a peer review process for medical research grant proposals for the Boudreau study and an innovation contest in an industrial firm for the current study. Different reactions to novelty can be expected in different environments and task contexts, as highlighted earlier (Liao et al., 2011).

6.2. Interactions or Dependencies Between Rating Criteria

Different observations were made with respect to the interaction between the three rating criteria novelty, feasibility and user benefit.

- The influence of the rating criteria on the investment decision was shown to ***depend on the topic/ category***. Some evidence that different idea types may need different rating priorities was shown in the current study. Namely while novelty played a dominant and significant role for investment decisions within technology excellence ideas and also process excellence ideas, the role of novelty for communication excellence investment decisions was not significant. Unique characteristics of different idea types were identified also by earlier authors (Boer & During, 2001; Abernathy & Clark, 1985)

- Adversely to previous articles where higher novelty was associated with lesser feasibility of ideas (Kristensson et al., 2004), the current results show that a significant number of cases were rated as both novel and feasible, whereas only few cases were rated as novel but not feasible. A subsequent correlation analyses confirmed a non-significant correlation between novelty and feasibility. Therefore within the current study the negative correlation between novelty and feasibility could not be confirmed. Rather, ideas could be perceived as both highly novel and highly feasible.

- The stronger influence of novelty for medium feasible or medium beneficial ideas showed, that if the evaluators were already convinced or disappointed by an idea's high or low user benefit/ feasibility, it was not so important any more whether the proposal was novel or not.

- It was interesting to see that proposals that were rated as highly novel and lowly feasible received 'go' decisions by both managers and employees in 69% of the cases, especially when the respective user benefit was perceived high as well. This indicates that not only familiar and plausible ideas can be favored (Rietzschel et al., 2010), but in the current study also unfeasible, novel ideas with some user benefit were supported considerably by 'go' decisions.

- It was suggested earlier to set up a strategy (Cooper & Kleinschmidt, 2007) and weigh those rating criteria depending on the strategy (Jiang & Klein, 1999; Magnusson, 2009; Englund & Graham, 1999). While using predetermined criteria to rate ideas is widely accepted and used, weighing those criteria in a relative importance to make a go/ no go decision is rather an exception. It was suggested earlier by Magnusson et al. (2012) to weigh those criteria to systematically filter out radical versus non-radical ideas, e.g. giving novelty a higher relative weighing and feasibility a lower relative weighing may automatically filter out the more radical ideas. The current study suggests that different criteria may be relevant for an investment decision depending on the idea category. For example, user benefit was used as the main criterion for the investment decision within the communication excellence category, whereas feasibility was decisive within process excellence, and novelty within technology excellence. An automated weighing process over all categories would probably not have been efficient to filter out the most favored ideas. With more experience, it could be beneficial to develop category-dependent weighing of the criteria when high quantities of ideas must be assessed. For the current application with a manageable quantity of ideas, domain knowledge and experience was the more relevant criterion to assess the rating criteria and their weight accordingly.

6.3. Consistency Between Rating Groups

The studies by Magnusson et al. (2012) and Riedl et al. (2010) already suggested that there is a good relative overlap between professional expert ratings and user ratings, if rated by the three universal rating criteria novelty, user benefit and feasibility. In the current study, not only the relative but even the total ratings were comparable. The strong and consistent agreement between the rating criteria per team as assessed by the managers and the employees may be attributed to the high amount of ideas with internal benefit and the delivery quality of the participating teams. The internal benefit of the ideas can be sufficiently judged with the supply side knowledge of the visitors. Attributing to the delivery quality of the innovating teams was the fact that the teams were familiar with the rating sheets, so they were prepared to answer questions of the jury and of visitors with regard to the novelty, feasibility and user benefit of their ideas (e.g. whether there was an analogous existing market solution for the technology excellence idea). These factors together may explain the strong and consistent agreement between the jury and the visitors' assessment. The managerial application of pre-assessment of ideas by employees via rating the novelty, feasibility and user benefit of ideas can therefore be supported with the results of this study.

6.4. True vs. Rated Novelty

The novelty rating depends on the knowledge of the evaluators. The surprisingly good consistency between jury and visitor ratings however could indicate that the 'real novelty' is close to the average of all ratings. The novelty ranking as proposed by the rating persons was generally consistent with the real project status of the proposals: proposals A, B, C and D had no budget allocated to realization at the time of the exhibition, proposal F was budgeted during the ripening phase of the innovaZion Rallye and implementation was ongoing, and proposal I had been almost finished except the last step which still needed to be accepted and funded. An exception was the proposal of team J which was

still in the concept phase, but despite of this it was apparently not perceived to be very novel to the rating persons.

6.5. Observations: The Use of Rating Criteria in the Current Study

There were several advantages in using rating criteria such as novelty, feasibility and user value as observed during the idea development and rating process during the current study:

A) The definition of rating criteria upfront helped the innovators (here: teams) to choose one promising idea out of several potential ideas to elaborate on further

B) The definition of rating criteria upfront helped the innovators to develop a realization strategy of their idea which addresses those important criteria of novelty, feasibility and user benefit.

C) The communication of rating criteria helped the innovators to be prepared for questions during the exhibition and the closure event, and to know what is expected from them (education effect).

D) The usage of rating criteria is an efficient approach for the jury to give substance to their go/ no go decisions, and to not accidentally miss important aspects for the final decision

E) The usage of rating criteria by the jury in order to structure the idea evaluation process was a way to transparently communicate their feedback to the teams

6.6. Limitations of the Study

A clear limitation of the current study is the sample representativeness, especially for the employees as out of about 1k employees only 16 filled out the sheets completely. Selection biases, e.g. attracting more pro-novelty employees to visit the exhibition can therefore not be excluded especially for the employee rating.

The rating criteria were furthermore filled out together with the go/ no go decision on one sheet, which may explain the tight correlation between go/ no go decisions and the four rating criteria novelty, feasibility, user benefit and idea quality. The go/ no go investment decision could not be entirely isolated from those criteria ratings for the employee and manager ratings. In this particular sense, only the extended crowd employee voting group was truly unbiased because they did not see the rating criteria while using their votes. Therefore, it is interesting to see that proposal B was selected by the extended crowd employee group, because proposal B has the highest score when novelty, user benefit and feasibility were to be added up.

Another limitation is the degree of actual novelty of the ideas: More novel/ radical ideas of distant markets may show different patterns in their effect on the investment decisions.

7. SUMMARY AND CONCLUSIONS

Novelty had a positive rather than a negative impact on the go/ no go decision of both managers and employees during all correlations and comparisons performed, which was also true for feasibility and user benefit. No anti-novelty bias could be confirmed in the context of the current innovation team contest, which represented an industry environment. This effect may be explained by specific expectations of the rating persons to an innovation contest, by variations on individual level, by differences between the current study and previous studies especially with respect to the research versus industry environment, as well as because the proposals may not have been unfamiliar/ novel enough to initiate an anti-novelty effect. Some jury members preferred a more feasible idea as their favorite idea and some preferred the more novel idea, indicating variation of novelty versus feasibility preferences on an individual level.

The ratings of the criteria novelty, feasibility and user benefit of the individual proposals by managers and employees were very consistent, not only in terms of a relative comparison but also in terms of the total results and this consistency may be attributed to the delivery quality of the participating teams and the type of ideas.

The relative relevance of the factors novelty, feasibility and user benefit for the final go/ no go decision varied by idea category. The go/ no go decisions were dominantly influenced by feasibility within process excellence, by novelty within technology excellence and by user benefit within communication excellence proposals. Such findings may be useful if an 'automated' idea selection processes were to be designed using systematic weighing of those criteria for proposal selections. A negative correlation between novelty and feasibility could not be confirmed and a considerable number of cases were observed, in which proposals were rated as both highly novel and highly feasible. Novelty had a stronger effect when ideas were moderately feasible or beneficial. Furthermore also unfeasible ideas were supported by the evaluators by managers and employees, if they were perceived as novel and beneficial at the same time.

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