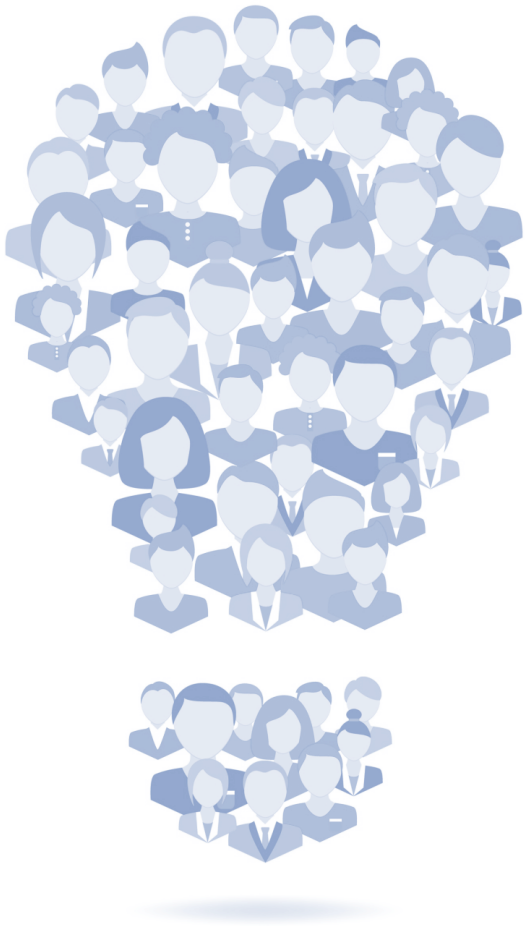
Crowdsourcing:
A complex challenge for being specific

A multiple case study on the effect of task characteristics in online innovation contests



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SUMMARY

By making use of crowdsourcing instruments, organizations have found a way to attract a motivated crowd of individuals for providing solutions for short and long-term problems. Individuals do not necessarily need to be experts on a subject to either help or inspire an organization with their day-to-day businesses. For organizations to come up with radical or incremental innovations, they can extend their internal R&D businesses by organising an innovation contest. Innovation contests are well-established mechanisms for eliciting innovation among both public and private organizations (Boudreau, Lacetera, & Lakhani, 2011).

Previous research on innovation contests has mainly focused on the quantity of the outcome in innovation contests while only limited research has been executed on the quality of the outcome in innovation contests. The outcome of the innovation contests is considered as the aggregate of all submissions. It has been shown that the task design influences the quantity of the outcome in innovation contests (Hjalmarsson, Juell-Skielse, & Johannesson, 2017). The influence of several task design aspects on quality dimensions of the outcome in innovation contests has not been researched to a broader extent.

This research has looked into the influence of two task characteristics, being the task complexity and the task specificity, on the quality of the outcome in innovation contests. The quality of the outcome in innovation contests was indicated by making use of three quality dimensions; feasibility, novelty and usability. By executing a desk research, 20 innovation contests were scored on the task complexity and task specificity of the task within the innovation contests. Furthermore, the initiators of these 20 innovation contests were interviewed on the quality of the outcome and additional insights were collected on arguments of the initiators for a specific task design in the innovation contests.

The results of the analyses have shown limited support for the influence of task complexity and task specificity on the quality dimensions which were researched. It was found that the task complexity negatively influences the feasibility of the outcome in innovation contests if the task complexity is high. Moreover, the task specificity negatively influences the novelty of the outcome in innovation contests if the task specificity is high. Additionally, task specificity positive influences the usability of the outcome of innovation contests. In conclusion, the influence of the task complexity and task specificity of the outcome in innovation contests is limited to certain scenarios which initiators need to take in mind when organising an innovation contest.

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In September 2013, I needed to choose a minor of 30 ECTS within my bachelor program Organizational Sciences at the VU in Amsterdam. By coincidence I heard of a minor program called Innovation Management and at that moment in time I could not have guessed that choosing that minor would in the end lead to this master's thesis. After successfully rounding off the minor program and retrieving my bachelor's degree, the only thing I wanted was to start with the master Innovation Sciences at Utrecht University. Over the past 3 years I have learned a lot about innovation in general, innovation in practice and innovation in other cultures. This was of course due to the courses within the master's program but especially because I was lucky enough to go on a study tour three times to experience innovation in San Francisco, Osaka & Kyoto and recently Cape Town. The last 3 years have been interesting, challenging and hopefully the next step to a successful career.

Writing a master's thesis is experienced by many people as a huge obstacle and people feel as if they will never be able to get it done and in the end receive their diploma. Fortunately, I did not experience it this way which is for the larger part the responsibility of my supervisor Maryse Chappin. From the first day on Maryse was there for me at any given moment. I could come by at her office almost any day of the week if I wanted to and she provided me with the best guidance I could have wished for. Therefore, I would like to thank her for all the times she provided feedback, made time to discuss any topic related to the thesis and gave me some extra motivation when I needed it the most. Thank you!

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"Be the one to stand out in the crowd."

- Joel Osteen

1. INTRODUCTION

Crowdsourcing has come to being in 2006 when Jeff Howe posed the term in an article in *Wired Magazine* referring to "The new pool of cheap labor: everyday people using their spare cycles to create content, solve problems, even do corporate R&D" (Howe, 2006, p. 1). By making use of crowdsourcing, an organization will be able to outsource part of their R&D to the crowd and accordingly e.g. be inspired or develop new products. Crowdsourcing is "...a strategic model to attract an interested, motivated crowd of individuals capable of providing solutions superior in quality and quantity to those that even traditional forms of business can" (Brabham, 2008, p. 79). The ideas of all individuals within the crowd aggregated or one single idea among the many may lead to a unique insight within an organizational problem.

Organising an innovation contest is a possibility for organizations to make use of the creative minds of the crowd and integrating them in early stages of innovation or letting them think of solutions for either short or long term problems[1]. Innovation contests are defined as "... a (web-based) competition of innovators who use their skills, experience and creativity to provide a solution for a particular contest challenge defined by an organizer" (Piller & Walcher, 2006; Bullinger & Moeslein, 2010 in Bullinger, Neyer, Rass, & Moeslein, 2010, p. 291). Research has shown that innovation contests are a well-established mechanism for eliciting innovation and are therefore frequently used in the private and public sectors (Boudreau et al., 2011).

To be of any added value for the organiser of the innovation contest, the outcome of the innovation contest needs to be of a high *quality*. The literature on the quality of the outcome of innovation contests has defined the quality of the outcome in different ways. Walter and Back (2009) take in account two measures for the outcome of innovation contests being the amount of submissions and the average quality of submitted ideas in which the quality was scored from useless to potential best idea. The quantity of submissions was also part of the quality score used by Füller, Hutter and Faullant (2011) in their research on online innovation contests. Yet, a quantity measure is not adequate in scoring the outcome of innovation contests as organizations might initiate an innovation contest with a purpose of retrieving e.g. a novel or feasible outcome instead of a high quantity of submissions. In innovation contests, the *outcome* of an innovation contest needs to be interpreted as the aggregate of all submissions. Therefore, to score the quality of the outcome in an innovation contest, other quality dimensions than just the quantity of submissions need to be considered.

In order for organizations to retrieve the desired outcome of their innovation contest it is interesting to know what task design aspects of innovation contests result in different kinds of high quality dimension outcomes. An overview of task design aspects is provided by Juell-skielse, Hjalmarsson, Juell-skielse, Johannesson and Rudmark (2014) who mention among others the contest period, type of organization and individual or team contributors as being influential design aspects for the outcome of innovation contests. Other authors have focused

[1] Next to innovation contests are also *open calls* a possibility to make use of the crowd. Open calls are different from innovation contests in not having a specific term on closure as well as not all open calls having a winning submission which receives a prize. Open calls will not be considered in this research.

on e.g. motives of contributors on the performance and reward structure as influential task design aspects (Brabham, 2010; Füller, Bartl, Ernst, & Mühlbacher, 2006). Yet, two potentially influential task characteristics which have only been limitedly researched in relation to the quality of the outcome are task specificity and task complexity. Task specificity has been known to influence the quantity of contributors in innovation contests (Hjalmarsson et al., 2017), but only limited research has been executed on the influence of task specificity on the quality of the outcome in innovation contests. Furthermore, task specificity has shown to be an important indicator for performance in relation to the individual goal-setting theory. Locke & Latham mention that "Specific goals are critical to the individual goal effect because they establish one minimum acceptable performance level…" (Locke & Latham, 1990 in O'Leary-Kelly, Martocchio, & Frink, 1994, p. 1287). For this reason, it is interesting to research what the influence is of task specificity on the outcome within an innovation contest. Next to task specificity has task complexity proven to be an important aspect which influences performance as well. Within decision-making literature, task complexity is particularly used as a key determinant of task strategy. The task complexity results in a cognitive demand and thereby influences the task strategy for the performance (Maynard & Hakel, 1997). Both task characteristics have thus been linked to performance and quality of the outcome within tasks accordingly, but have not been researched to a larger extent in the crowdsourcing field of literature. To determine the influence of these task characteristics on the quality of the outcome in innovation contests, this research will answer the following research question:

What is the influence of task complexity and task specificity on the quality of the outcome within an innovation contest?

Initiators of innovation contests may be looking for different kind of outcomes. Whereas one initiator may be hoping for novel ideas may another initiator desire to retrieve usable ideas. The influence of task complexity and task specificity on either one of these quality dimensions may differ depending on the degree to which a task is complex or specific. By researching the influence of the task complexity and task specificity of the task description in an innovation contest on the quality of the outcome within an innovation contest, this research adds to literature insights in the effect task design aspects on the quality of the outcome within innovation contests. As this research will focus on the innovation contests as level of analysis rather than e.g. the crowd level, it also adds to literature a new perspective on researching innovation contests and its outcome. The results are relevant to organizations who are planning on organising an innovation contest or have organised an innovation contests before but were not satisfied with the quality of the outcome of the innovation contest. Furthermore, this research provides initiators of innovation contests insights in how task complexity or task specificity directly influences the quality of the outcome within innovation contests.

The next sections will start with a theoretical framework in section 2 in which all key variables are explained and propositions are constructed. Section 3 entails the methodological framework including the data collection methods and analysis methods. Section 4 provides the results of this research and some additional insights. Finally, section 5 provides a discussion of the results, theoretical and managerial implications and a conclusion.

2. THEORETICAL FRAMEWORK

2.1 INNOVATION CONTESTS

Several independent actors within the process of initiating and executing an innovation contest can be identified. An innovation contest is put to practice when *the initiator* distinguishes a problem or requires input for any R&D related task as e.g. the ideation phase of new products. The initiator is the party which is looking for solutions or creative input and specifies the criteria and parameters for the request, thus the organization which initiates the innovation contest. The initiator furthermore specifies the acceptance criteria and pays rewards after the successful completion of the task (Vuković, 2009, p. 687). For the initiator, it is of great importance to connect to a large crowd and define their problem in such a way that the chances on the desired outcome are highest. To increase the chances of connecting to a large crowd, initiators make use of *crowdsourcing platforms*. Crowdsourcing platforms serve mainly as a facilitator for innovation contests and may help initiators with designing several characteristics of an innovation contest. The crowdsourcing platforms are marketplaces which serve to attract the crowd for submissions on behalf of the initiator (Chanal & Caron-Fasan, 2010). Furthermore, *the crowd* is made up of any individual who is willing to contribute to the problem statements in the innovation contests.

Almost all types of innovation contests are web-based and community based. A distinction among innovation contests can be made in either problem-solving innovation contests or creative innovation contests. Whereas problem-solving innovation contests are looking for a solution to a posed problem are creative innovation contests related to design aspects for e.g. a concept or product. Furthermore, most innovation contests are regarded as selective crowdsourcing, meaning it is aimed at competition among contributors who need to come up with a best concept for the initiator to win a reward prize (Schenk & Guittard, 2009).

2.2 SUCCESS OF INNOVATION CONTESTS

Over time several studies have made an effort to define the quality of the outcome in external idea-generation processes. The dimensions of quality which can be used to look at the outcome are quite diverse. Some researchers have looked at quality dimensions like customer benefit, quantity, novelty and feasibility (Füller et al., 2011; Poetz & Schreier, 2012). Others have focused on the usefulness of ideas next to the novelty and quantity of submissions (Kudrowitz, Te, & Wallace, 2012). Furthermore, Dean, Hender, Rodgers and Santanen (2006) make use of four quality dimensions, being the novelty, relevance, workability and thoroughness. As already mentioned in the introduction, this research will not regard quantity of submissions as a relevant quality dimension. Another quality dimension which does not seem relevant but has been researched before is the thoroughness of the outcome in idea-generation processes. Thoroughness is described as to what matter an idea is worked out in detail (Dean et al., 2006). Yet, the quality of the outcome of innovation contests is not likely to be influenced by the details of the submissions as the initiators are looking for ideas which they can work with rather than ideas which contain a lot of details.

The other quality dimensions which were mentioned will be used to form three quality dimensions for this research. The usefulness of ideas from Kudrowitz et al. (2012) is linked to relevance from Dean et al. (2006) in forming the quality dimension usability in this research. The quality dimension of novelty will be based on Dean et al. (2006). The quality dimension

workability from Dean et al. (2006) will be combined with the feasibility quality dimension used in Poetz and Schreier (2012) to form the quality dimension feasibility in this research.

2.2.1 FEASIBILITY

Dean et al. (2006, p. 650) mention workability as "an idea [which]… does not violate known constraints or can easily be implemented", this will be reframed for this research to feasibility. The feasibility of ideas is about to what matter they can be implemented but also entail a commercial aspect. Additionally, Poetz & Schreier (2012, p. 14) mention that the feasibility of ideas can be defined by how easy they can be translated into a commercial product. For an initiator of an innovation contest it is important that submissions can easily be implemented and that they can easily be translated into a commercial product. This is because innovation contests are used to stimulate or replace the R&D departments. This research will regard the outcome of an innovation contest as usable if the outcome does not violate known constraints, if the outcome can easily be translated into commercial products and if the outcome can easily be implemented.

2.2.2 NOVELTY

For submissions to be beneficial to the initiator of an innovation contest they need to have a certain level of novelty. Novelty among submissions is needed as the novelty of a product will likely result in a first mover advantage and novel ideas may function as inspiration for the organization. First mover advantages are defined as the ability of pioneering firms to earn positive economic profits (Liebermann & Montgomery, 1988, p. 41). Novel submissions contain ideas that are rare, unusual, or uncommon in which the most novel idea is totally unique while the least novel idea is the most common one (Connoly, Routhieaux & Schneider, 1993; MacCrimmon & Wagner, 1994 in Dean et al., 2006, p. 648). Furthermore, the novelty of any submissions must be judged in relation to how uncommon it is to the initiator of the innovation contest or how uncommon it is in the overall population of ideas (Dean et al., 2006, p. 648). This research will regard the outcome of an innovation contest novel if the outcome is novel to the initiator of the innovation contest.

2.2.3 USABILITY

For submissions to be usable for the initiator of an innovation contest they should solve the problem which is at hand or it must be reasonable to expect that the submissions are relevant for the organization (Dean et al., 2006). The usability of the outcome of innovation contests is related to how well the outcome deals with the problem which is stated (Eisenberger & Roades, 2001 in Dean et al., 2006). If the outcome of the innovation contest is not applicable to solve the problem or to cover all aspects of the problem, then the usability of the outcome of the innovation contest is low. Other authors also take into account the applicability and the adequateness of the provided ideas (Besemer & Treffinger, 1981 in Dean et al., 2006, p. 661). This research will regard the outcome of an innovation contest usable if the outcome of the innovation contest is adequate, deals with all aspects of the problem and solves the problem.

2.3 TASK CHARACTERISTICS

The task design within an innovation contest consists of several characteristics such as among others the task complexity and task specificity. For an initiator of an innovation contest it is of great importance to know how the task should be designed in order for it to retrieve the desired outcome. As task complexity and task specificity influence the way the crowd experiences a

task, it is interesting to see how these task characteristics influence the quality of the outcome in innovation contests. The quality dimensions which are researched in this thesis are the previously described feasibility, novelty and usability. The task characteristics are elaborated on in 2.3.1 & 2.3.2 and the mechanisms between the task characteristics and the quality dimensions are described per proposition.

2.3.1 TASK COMPLEXITY

Task complexity has been recognized as a key determinant that influences and predicts human performance and behaviour (Liu & Li, 2012). Liu & Li (2012, p. 559) define task complexity as "... the aggregation of any intrinsic task characteristic that influences the performance of a task". Others have defined task complexity as being differently for everyone as information is interpreted differently and therefore regard task complexity as a subjective measure (Byström & Järvelin, 1995). Task complexity influences the strategy which contributors use to deal with a task. If a task is complex, then the contributors will need to organize and prioritize information to deal with the task complexity as the cognitive demand increases (Maynard & Hakel, 1997). An objective measure for task complexity is used in this research due to the level of analysis being the innovation contest and not the contributors, as mentioned in the introduction. This research will therefore make use of Campbell & Gingrich (1986, p. 164) in defining a complex task as "tasks which have several, often conflicting elements which place substantial cognitive demands on the task-doer for comprehension and execution". This research will regard a task as complex if it has one or more of the following characteristics: multiple subtasks, multiple elements within subtasks, multiple relationships among subtasks and elements within these subtasks. The degree to which a task is complex depends on the degree to which the characteristics of task complexity are present. The result of the presence of the number of characteristics of task complexity influences the cognitive demand on the contributor which influences the performance of the contributor.

If the task complexity of an innovation contest is high, then the majority of subtasks and elements within the initial task will be related to each other which results in a high cognitive demand on the contributors. A high cognitive demand will result in contributors finding it hard to deal with all relations among the different elements within the task. Therefore, the contributors will need a lot of skills and experience with complex tasks to come up with submissions which can easily be implemented while not violating known constraints. On the contrary, a low task complexity will lead to a low cognitive demand resulting in contributors finding it relatively easy to come up with ideas which are easily implemented and do not violate known constraints. For this reason, the following proposition is expected:

Proposition 1: The task complexity negatively influences the feasibility of the outcome in innovation contests.

A high task complexity within an innovation contest will challenge the cognitive demand of the contributors to tap into creative ways of thinking for coming up with a new idea. The fact that the contributors will need to connect a lot of different elements of the task to come up with a solution to the problem will result in unlikely and unusual thoughts. Connecting these thoughts may lead to rare insights which in the end result in novel ideas. If the task complexity is low, the contributors will not be challenged in their thinking patterns and therefore rely on what

they already know, resulting in a low novelty of the outcome in innovation contests. For this reason, the following proposition is expected:

Proposition 2: The task complexity positively influences the novelty of the outcome in innovation contests.

If the task complexity within an innovation contest is high, it will result in the contributors having to deal with more subtasks and elements within them. This will lead to an increased cognitive demand among the contributors. A high cognitive demand will make it hard for the contributors to deal with all aspects of the problem at the same time. Furthermore, a high cognitive demand will challenge contributors to come up with a complete solution as there are many subtasks for the problem. For this reason, it is more likely that among tasks with a high complexity the usability of the outcome in innovation contests is low. Innovation contests with a low task complexity, on the other hand, will result in a high usability outcome as there are only a few subtasks or elements within the main task. Therefore, tasks with a low task complexity are more likely to result in a high usability of the outcome in innovation contests. For this reason, the following proposition is expected:

Proposition 3: The task complexity negatively influences the usability of the outcome in innovation contests.

2.3.2 TASK SPECIFICITY

The task specificity within an innovation contest influences the outcome as the contributors will retrieve less or more specifics on the task and the expected outcome accordingly. If a task is specific it means it is so clearly expressed that it leaves no doubt about the meaning. The task specificity thus addresses the openness and clearness of the initiator's problem (Piller & Walcher, 2006). It furthermore indicates whether the initiator leaves room for the contributors' own interpretation. This research defines task specificity as the degree to which a task restricts the contributors in their ways of thinking. People are likely to use provided specific information as a starting point for the ideas being developed (Ward, Patterson, & Sifonis, 2004). A specific task may therefore limit the flexibility of thinking patterns and restrict multiple interpretations of the task and its requirements (Ye & Kankanhalli, 2013). However, the task specificity can also clarify what the goal of the innovation contest is by providing elaborate details on the subject. If an initiator provides a lot of specifics and thereby deters the possibility of different interpretations, contributors will more easily understand the task (Leimester et al., 2009; Ward et al.,2000 in Ye & Kankanhalli, 2013, p. 233).

The task specificity of an innovation contest is of importance for the feasibility of the contributions as an innovation contest with a high task specificity will probably look for an idea or concept with a specific scope (Leimeister, Huber, Bretschneider, & Krcmar, 2009, p. 202). By being highly specific on the scope of the task, the initiator will provide many preconditions and limitations which the contributors will need to take in mind for their submissions. The preconditions and limitations provide information on what the initiator regards as feasible and thus it is expected that a high task specificity will lead to a feasible outcome in innovation contests. If there is a low task specificity, meaning a low amount or no limitations or preconditions in the innovation contest, the contributors will not know what is required in the submissions for it to be feasible. For this reason, the following proposition is expected:

Proposition 4: The task specificity positively influences the feasibility of the outcome in innovation contests.

If the task specificity of an innovation contest is high, then the initiator provides a lot of information on design requests or sets specific limitations and preconditions. These limitations will result in contributors using these limitations as a starting point for their ideas. Ward et al. (2004, p. 2) state "If people develop new ideas for a particular domain, the predominant tendency is to retrieve fairly specific, basic level exemplars from that domain". This implies that by limiting the contributors and setting specific preconditions, the contributors are less likely to come up with novel submissions. On the contrary, if the task specificity is low, the contributors will not be restricted or limited in any way and therefore can come up with anything they can think of, thus increasing the chance on novel ideas. For this reason, the following proposition is expected:

Proposition 5: The task specificity negatively influences the novelty of the outcome in innovation contests.

For an idea to be usable for the initiator, it needs to deal with all aspects of the stated task description. A high task specificity will mean specific requirements within the task description. These specific requirements can reduce the uncertainty related to the task which can ease the process of drawing from exemplars for solutions (Ye & Kankanhalli, 2013). Thus, by giving specific requirements and thereby providing clear instructions how to deal with all aspects of the task, it is expected that the usability of the outcome will be high. On the other hand, if the task specificity is low then the contributors will not know what is expected of them as the specifics on the requirements are not provided. This may result in the contributors submitting non-usable ideas. For this reason, the following proposition is expected:

Proposition 6: The task specificity positively influences the usability of the outcome in innovation contests.

2.4 CONCEPTUAL MODEL

Figure 1 illustrates the mentioned propositions in the previous sections whereas P1 represents proposition 1 and P2 represent proposition 2 and so forth.

Task characteristic		Expected influence	Quality dimension
Task complexity	P1	Negative	Feasibilty
	P2	Positive	Novelty
	P3	Negative	Usability
Task specificity	P4	Positive	Feasibilty
	P5	Negative	Novelty
	P6	Positive	Usability

Figure 1 *Overview of the propositions*

3. METHODOLOGICAL FRAMEWORK

3.1 RESEARCH DESIGN

The objective of this research is to create a better understanding of how task complexity and task specificity influence the quality of the submissions within an innovation contest. By looking into multiple case studies, in-depth arguments for why initiators have chosen to design the task of the innovation contest in a specific way can be identified. A multiple case study design was deemed most suitable as this research design offers the opportunity to examine the task designs in contrasting or similar contexts (Bryman, 2012). An advantage using a multiple case study instead of an experiment is to possibility of investigating a contemporary phenomenon within its real-life context (Yin, 2006, p. 13). A cross-sectional design with questionnaires would not be able to provide in-depth insights while an experimental research would not be feasible as initiators would have to adapt their innovation contests for this research. Furthermore, a longitudinal design does not fit the scope and time span of this research and is therefore not feasible. Thus, a multiple case study is a grounded choice as this study focuses on discovering patterns between two task characteristics and multiple dimensions of quality within contrasting and similar contexts. This research has used different types of data collection and different types of units of observation for looking at the unit of analysis being the innovation contest. The data collection methods used are a desk research in which the unit of observation is the task description of the innovation contest while the unit of observation during the semi-structured interviews are the people who initiated the innovation contests, being the initiators.

3.2 CASE SELECTION

Most innovation contests are organized in collaboration with a crowdsourcing platform. For that reason, this research has made use of a crowdsourcing platform for the case selection and data collection. The best-known crowdsourcing platform in the Netherlands is called Battle of Concepts. Battle of Concepts is a crowdsourcing platform which aims at facilitating a platform that organizations can use to promote their innovation contest and reach out to the crowd. Battle of Concepts has been active as a crowdsourcing platform for over 10 years and is the most popular crowdsourcing platform in the Netherlands. Recently, Battle of Concepts has started with two additional crowdsourcing sub-platforms being Citychallenges and Start-upchallenges. Citychallenges is a crowdsourcing platform which mainly organises innovation contests in collaboration with public organizations and municipalities. Start-upchallenges hopes to set up start-upchallenges in collaboration with organizations who are looking for new start-up ideas. As this research focuses on innovation contests, cases were only selected from Battle of Concepts and Citychallenges. The crowd which both platforms address differs in that Battle of Concepts hopes to attract students and young professionals only while anyone is allowed to participate in Citychallenges. Battle of Concepts and Citychallenges provide open access to all previous innovation contests and task descriptions. As Battle of Concepts is the largest crowdsourcing platform in the Netherlands and the data are well accessible, it was most convenient to use Battle of Concepts and the sub-platform Citychallenges as the primary research source for this thesis. Furthermore, by focusing on Dutch innovation contests only, this research aimed to hold stable as many circumstances as possible.

A purposive sampling technique was used to select relevant cases for answering the research question. The cases were furthermore selected on the following characteristics: initiated in either 2015 or 2016, deadline for submission in 2015 or 2016 and presence of a task

description. In total 34 innovation contests met the selection characteristics and were selected for the dataset.

3.3 DATA COLLECTION

In order for the propositions to be tested, data from separate sources was needed. The data on task complexity and task specificity was collected using the task descriptions from the innovation contests. The first phase of the data collection, being the desk research, was focused on classifying the innovation contests high or low on task complexity and task specificity. The second phase of the data collection aimed at executing semi-structured interviews with the initiators of the innovation contests. Within the second phase, data on objective quality dimension measurements and subjective quality dimension measurements was gathered. It should be noted that the two phases ran parallel as the scoring process on task complexity and task specificity on an innovation contests only happened after an appointment for an interview was made with the initiator of the innovation contest. The data on the scores of the quality dimensions within the innovation contests was collected during the interviews.

The desk research started by collecting all task descriptions from the 34 innovation contests that met the previously mentioned characteristics. The task descriptions of the cases were used to make a classification of the task complexity and task specificity. To define whether a task of an innovation contest has a high or low task complexity or a high or low task specificity, several indicators for both task characteristics were constructed and evaluated during an iterative process. The indicators are shown in the operationalization in 3.4. Additionally, the desk research was used as a foundation for the semi-structured interviews. By having read all task descriptions upfront, there was a better opportunity of posing in-depth questions in the interviews.

All initiators of the 34 innovation contests were initially contacted by telephone. Most initiators which were reached were able to plan an interview instantly while others provided an e-mail address to send an email with a request for the interview. After many attempts of trying to reach the initiators of all innovation contests 8 initiators were still not reached after which was decided to stop trying to reach them. Another 6 initiators were not able to be interviewed due to several reasons such as e.g. initiators of the innovation contest not working at the company any more or simply no time.

The semi-structured interviews with the initiators were executed by telephone to gain insights in the companies' perception on the innovation contest and its task design which were researched and collect the data on the quality dimensions. The interviewees were first asked about the goal of the innovation contest and what their opinion was on making use of external sources before asking them about the task design and the quality of the outcome. A topic and questions list was constructed for the data collection in the interviews. The list was used as a guideline for the interviews to retrieve as much data as possible and shown in appendix A. Example questions are shown below all topics as an illustration of how they might have been posed to the interviewees.

In total 20 interviews were executed with the initiators of 20 innovation contests. The interviews were approximately 40 minutes each, while 18 of the total 20 interviews were

recorded. One interviewee didn't allow recording of the interview while the recording software did not function in another interview.

3.4 OPERATIONALIZATION

To analyse the data on all variables properly, an operationalization was needed of several concepts. The operationalization is shown per variable which was used in this research.

3.4.1 INDEPENDENT VARIABLES

The collected task descriptions were analysed using an operationalization of both task complexity as task specificity. The scores of the analyses were used to classify them either high or low. The operationalized concepts are shown in table 1 and 2 while the classification schemes are shown in table 3 and 4. The aggregate of all indicators resulted in a low or high classification of both task characteristics.

Concept	Indicators
Task complexity	Amount of subtasks
	Amount of elements within the subtasks
	Amount of relationships among subtasks
	Amount of relationships among elements within the subtasks

Table 1 *Operationalization of task complexity for desk research*

Concept	Indicators
Task specificity	Amount of specific design/idea requests
	Amount of details on the requests
	Amount of detailed preconditions
	Amount of given limitations

Table 2 *Operationalization of task specificity for desk research*

Score	Meaning	Explanation
High	The task complexity is high	A lot of subtasks and elements are present. The majority of the subtasks and elements are related.
Low	The task complexity is low	A few to several subtasks and elements are present, no or a few relationships among the subtasks and elements are present

Table 3 *Classification scheme for task complexity*

Score	Meaning	Explanation
High	The task specificity is high	A lot of details, requests, preconditions and limitations are provided.
Low	The task specificity is low	No or a few details, requests, preconditions and limitations are provided

Table 4 *Classification scheme for task specificity*

3.4.2 DEPENDENT VARIABLES

The quality dimensions of the outcome in the innovation contests were scored both objectively as subjectively. An objective quality dimension score entails the factual results in the outcome while the subjective quality dimension score is about the perception of the interviewee on the

factual results in the outcome. The data on the dependent variables feasibility, novelty and usability were provided by the interviewees in the interviews making use of the earlier mentioned topic list. The scoring of the quality dimensions was done using the classification schemes in tables 5 and 6.

Score	Meaning	Explanation
High	A high score on the quality dimension was found	The factual results showed that a significant amount of submissions was feasible/novel/usable
Low	A low score on the quality dimension was found	The factual results showed that none or a few of the submissions was feasible/novel/usable

Table 5 *Classification scheme objective quality dimensions*

Score	Meaning	Explanation
High	A high score on the quality dimension was perceived	The interviewee indicated that they found the outcome of the quality dimension high
Low	A low score on the quality dimensions was perceived	The interviewee indicated that they found the outcome of the quality dimension low

Table 6 *Classification scheme subjective quality dimensions*

3.4.3 ADDITIONAL VARIABLES

This research has taken other variables into account as well such as the purpose of initiating the innovation contest, type of organization and the amount of submissions. These variables are operationalized in table 7.

Variable	Indication	Explanation
Purpose of initiating	Creative	The innovation contest aimed to attract submissions which were creative in its essence
	Problem solving	The innovation contest aimed to attract submissions which were a solution to a posed problem
Type of organization	Profit	The organization which organized the innovation contest is a profit organization
	Non-profit	The organization which organized the innovation contest is a non-profit organization
Quantity of submissions	Number of submissons	The number of submissions which were submitted in the innovation contest

Table 7 *Overview of additional variables*

3.5 DATA ANALYSIS

The desk research resulted in either a high or low score on the task characteristics of each innovation contest. All innovation contests were put in a Microsoft Office Excel table to construct a complete dataset with all scores of each variable together. The end result of this table is shown in section 4. To retrieve the useful data of the semi-structured interviews, the interviews were transcribed and used for coding making use of the program NVivo. The coding process initially consisted of coding the transcripts on the independent and dependent variables while other interesting quotes were coded as well. The transcripts were coded by making use of high and low codes of each quality dimension. For example, if within a transcript was mentioned that over half of all submissions were feasible then it was coded as ‘Feasibility high’ and if it was mentioned that only one of all submissions was feasible then it was coded as ‘Feasibility low’. In the process of coding all transcripts, the complete dataset was constructed.

During the coding of the innovation contests it appeared that the desired outcome across the innovation contests was different and therefore a new code was constructed 'Desired outcome'. Some interviewees provided insights in what they thought would be an explanation for a certain phenomenon or possible mechanism. These statements were coded in relation to the quality dimension they referred to, new codes were therefore constructed being e.g. 'Novelty mechanism'. Another code which was constructed throughout the coding process was the code 'Follow up after innovation contest'. This code was constructed as in several interviews it was discussed whether the submissions of the innovation contests had resulted in a change of strategy or whether a submission was implemented.

After the completion of the dataset, the data was analysed to see whether any expected influences had appeared. In order to do so, figures were constructed with four quadrants to plot each individual innovation contest in the correct quadrant. In order for each proposition to be tested two figures were constructed, one for the objective quality dimension scores and one for the subjective quality dimension scores. The results of both scores were considered in concluding whether an influence between the independent and dependent variables was present. An example of a figure which was used for interpreting the results is shown in figure 2. As it was expected that the task complexity would negatively influence the feasibility of the outcome in innovation contests, each innovation contest with a high task complexity was expected to have a low feasibility outcome (represented in Q3) and each innovation contest with a low task complexity was expected to have a high feasibility outcome (represented in Q2). The figure illustrates each innovation contest with its corresponding ID number in the correct quadrant. If the situation in figure 2 would appear, then a clear indication of the negative influence of task complexity on feasibility would be provided. However, if the results of the dataset would show the example figure of figure 3, then no evidence was provided for a clear influence of the task complexity of an innovation contest on the feasibility of the outcome in innovation contests. As each number corresponds to the ID of an innovation contest, it was looked into whether the innovation contests in a specific quadrant had any other similar characteristic as e.g. being a profit organization. Thus, based on the combined figures of both objective and subjective quality dimension scores with a task characteristic a conclusion was drawn on the influence of the task characteristic on the quality dimension and thereby whether the expected proposition was supported.

		Task complexity: *High*	Task complexity: *Low*
Objective feasibility: *High*		Q1 - ∑=0	Q2 1,2,3,6,7,8,10,12,17,19,20 ∑=11
Objective feasibility: *Low*		Q3 4,5,9,11,13,14,15,16,18 ∑=9	Q4 - ∑=0

Figure 2 *Example of Task complexity and objective feasibility*

Objective feasibility \ Task complexity	*High*	*Low*
High	Q1 14,15,16,18,20 ∑=5	Q2 8,10,12,17,19 ∑=5
Low	Q3 4,5,9,11,13 ∑=5	Q4 1,2,3,6,7 ∑=5

Figure 3 *Example of task complexity and objective feasibility*

3.6 RESEARCH QUALITY INDICATORS

The reliability of a research involves the stability of the measures and results within the research (Yin, 2006). By making use of the clearly stated criteria for the case selection and defining the task complexity and task specificity of each case as transparent as possible this research aimed to ensure a high reliability. The replicability of this research was also ensured by operationalizing as many steps as possible as this will provide someone else to execute the procedures that constitute the measures of this research (Bryman, 2012, p. 47).

Internal validity is concerned with the issue of causality. Within this research it is impossible for the submissions to influence the task description, so problems of endogeneity were not expected. Also, the fact that the propositions are based on literature increases the internal validity. Another factor which increases the internal validity is the fact that the purpose of initiating and type of organization are taken into account.

External validity is related to the question of whether the results of a study can be generalized beyond the specific research context (Bryman, 2012, p. 47). This research aimed to increase the external validity by using a variety of several cases. As this research focussed on innovation contests with specific preconditions and being organized in collaboration with Battle of Concepts, the overall generalizability to other platforms and innovation contests should be handled with care.

The construct validity within this research was enhanced because all variables are constructed based on literature. Furthermore, by looking at both subjective and objective results of the quality dimensions this research uses multiple sources of evidence and thereby increases the construct validity.

4. RESULTS

This section provides the results of the analyses on the expected propositions which are discussed using both the objective quality dimension scores as the subjective quality dimension scores. It starts off by providing a description of the results after which the outcome per quality dimension is described. Throughout the description of the results, examples are provided of why the outcome of an innovation contest is scored high or low. After the analyses of the expected propositions an additional analyses subsection provides insights in the interaction effects of both task characteristics on the quality dimensions. Also, additional analyses are provided on the influence of the task characteristics on the quantity of the submissions within innovation contests. Finally, some additional insights are provided on the gathered data.

4.1 DESCRIPTION OF THE INNOVATION CONTESTS

The dataset consists of 20 innovation contests of which 7 have been initiated by profit organizations while 13 have been initiated by non-profit organizations. Furthermore, 9 innovation contests were problem solving innovation contests and 11 were creative innovation contests. The quantity of submissions per innovation contest differs from 40 being lowest and 183 as the highest number of submissions while the average was just over 86 submissions per innovation contest. The lowest amount of total prize money which an innovation contest has provided was €1000 and the highest amount was €5000 while the average total prize money was about €2800. Additionally, the highest amount of first prize money was €2500, the lowest was €350 and the average was €1290. As mentioned in the methods, all innovation contests have been organized making use of the crowdsourcing platform Battle of Concepts. Only 2 of the 20 initiators had organized an innovation contest before, both had made use of Battle of Concepts.

The initiators of the innovation contests provided insights in their motives for organising an innovation contest which were quite diverse across the dataset. An example is interviewee #10, initiator of a non-profit innovation contest in a municipality, who mentioned that making up ideas from the town hall and grounding your ideas on your perceived knowledge is not enough for knowing whether your idea meets the wishes of the citizens (IC#10). Thus, by involving the target group in the creation process, the chance on success is much larger (IC#10). Other interviewees organised the innovation contests as they quite identically stated that the people who do not work within the company itself is always bigger and possess more knowledge than the employees of the companies, therefore not including outsiders in your knowledge creation processes would be a great loss (IC#13 & IC#14). A third example are IC#12 and IC#18 who were hoping to create awareness and get a conversation going about their innovation contest topic (IC#12 & IC#18). This argument was also mentioned by interviewee #3: "…another motive was definitely to involve students and young professionals in the subject" (IC#3). A final example is IC#9 and IC#20 who both were motivated to organise an innovation contest to test whether an innovation contest could be a beneficiary instrument for their organizations (IC#9 & IC#20). As these examples show, an innovation contest may have all kind of motive for initiating an innovation contest.

4.2 OUTCOME OF INNOVATION CONTESTS

This section includes the results of the quality dimensions for the outcome of the innovation contests. Each quality dimension is elaborated on individually and the complete dataset is provided in table 8.

4.2.1 FEASIBILITY

The scores of the outcomes of the innovation contests among the dataset regarding the feasibility, both objective feasibility as subjective feasibility, are rather low. Only 6 outcomes of innovation contests were scored as having a high feasibility outcome among the objective feasibility scores. Among the subjective feasibility scores of the outcome in the innovation contests only 7 scored high. Thus, the subjective feasibility outcome of one innovation contest was scored high while the objective feasibility outcome was scored low. The difference in the feasibility outcomes of the innovation contests is due to the interviewee of IC#17 who was very satisfied with the feasibility of the top 3 submissions of all submissions, yet these were the only feasible submissions among the lot (IC#17).

An example of an innovation contest in which a high subjective feasibility outcome and a high objective feasibility outcome was found was provided by the interviewee of innovation contest #18 who said: “Definitely, you see there were quite a lot of submissions which scored good on feasibility, therefore I felt quite positive about it” (IC#18). One interviewee who was looking for ways of integrating more breaks during a workday in healthcare mentioned that there were a lot of submissions based on apps (IC#8). Yet, they wondered whether a municipality should take a leading role in developing an app or whether the different parties in the specific market themselves should develop an app (IC#8). Therefore interviewee #8 mentioned that regarding the feasibility of an idea, it should be questioned whether an idea is scored as feasible because it might be feasible in general or it is scored as feasible if the initiator regards the idea as feasible (IC#8). Interviewee #1 followed up on questioning when a submission should be interpreted as feasible. Among all submissions (>150) in innovation contest #1 only 16 had a significant quality in which only a small part of these 16 was feasible for this year. Other submissions might have been feasible for follow-up years but their subjective feasibility score was based on looking at short term feasible submissions (IC#1). Furthermore, one interviewee was not able to answer the questions about feasibility. Within the process of scoring the submissions, interviewee #5 together with the other judges, selected the best submissions which seemed feasible at first but interviewee #5 was not sure whether the feasibility scores were high or low. Because of this lack of knowledge, she did not know how many of the submissions were regarded as feasible or not (IC#5). Summarizing, scoring the feasibility of the outcomes within innovation contests seemed to be straightforward in some innovation contests while a few initiators found it hard to score the submissions on feasibility.

4.2.2 NOVELTY

The objective novelty and subjective novelty scores within the innovation contests in the dataset are quite low as well. As in feasibility, only 6 of the innovation contests were scored as having a high objective novelty outcome in the innovation contests. The subjective novelty scores were a bit higher, resulting in 8 innovation contests in total with high subjective novelty outcomes. The difference in objective and subjective outcomes resulted from IC#13 and IC#15 who were both really impressed by the novelty of the top few submissions but the rest of the submissions lacked greatly in novelty (IC#13 & IC#15). Interviewee #13 stated that there were

2 completely novel submissions which he had never heard of or read about in any journal, yet all other submissions were not regarded as new due to several recognizable elements (IC#13).

Another interviewee provided insights in when they regarded the submissions as new when answering the question what they thought of the novelty of the outcome: “Pretty good actually, it had to be novel to the municipality and not novel to the world. Most of the submissions we did not know, that originality has given us inspiration and helped us to get to new ideas as well” (IC#9). An example of a submission which was not new in its essence but was new to the initiator of the innovation contest, and thereby scored as high, was provided by interviewee #10: “The thing I did not know was e.g. geocaching in which an app is used to find things which are buried in the ground in a certain area. I did not know it, yet it seems to be some trend in the Netherlands. I would never have come up with such a thing” (IC#10). These examples illustrate the value of novel submissions within innovation contests to the initiator of an innovation contest.

Novel submissions also seem to have a confirmatory role for initiators. Interviewee #14, who scored the novelty of the outcome high, said that among the novel submissions there were things which they once thought about in their wildest dreams but were not thought of as realistic. Yet, these same wild dreams were mentioned among the outcome which triggered the initiators in thinking they might actually need to do something with their wildest dreams (IC#14). The novelty has also disappointed some initiators due to the low scores in novelty while they had hoped for completely novel ideas (IC#2 & IC#3). The low novelty scores also seem to come from different contributors submitting the same idea. Interviewee #4, interviewee #5 and interviewee #20 mentioned that many submissions were alike (IC#4, IC#5 & IC#20) or the total of the submissions was easily split up in four main idea-related groups of submissions (IC#12). Furthermore, one interviewee did not give a complete answer to the questions regarding the novelty of the outcome within the innovation contest (IC#6) and is therefore not considered in the novelty analysis. Summarizing, the novelty of the submissions was several times disappointing for the initiators while some contributors have stood out regarding the novelty of their idea.

Innovation contest ID	*Task complexity*	*Task specificity*	*Objective feasibility*	*Subjective feasibility*	*Objective novelty*	*Subjective novelty*	*Objective usability*	*Subjective usability*	*Type of organization*	*Purpose of initiating*
1	Low	Low	Low	Low	Low	Low	Low	High	Profit	Creative
2	Low	High	Low	Low	Low	Low	Low	Low	Profit	Creative
3	Low	Low	High	High	Low	Low	Low	Low	Profit	Creative
4	High	High	Low	Low	Low	Low	High	High	Non-profit	Problem solving
5	Low	High	x	x	Low	Low	High	High	Non-profit	Problem solving
6	Low	Low	High	High	x	x	High	High	Non-profit	Creative
7	Low	Low	Low	Low	High	High	Low	Low	Profit	Creative
8	Low	Low	Low	Low	Low	Low	Low	Low	Non-profit	Problem solving
9	Low	Low	Low	Low	High	High	Low	Low	Non-profit	Problem solving
10	Low	High	High	High	High	High	High	High	Non-profit	Creative
11	High	High	Low	Low	Low	Low	Low	Low	Non-profit	Problem solving
12	Low	High	High	High	Low	Low	High	High	Non-profit	Problem solving
13	High	Low	Low	Low	Low	High	Low	Low	Non-profit	Creative
14	High	Low	Low	Low	High	High	Low	High	Profit	Creative
15	High	High	Low	Low	Low	High	High	High	Profit	Creative
16	High	High	Low	Low	High	High	High	Low	Non-profit	Creative
17	Low	Low	Low	High	High	High	x	x	Profit	Problem solving
18	High	High	High	High	Low	Low	High	High	Non-profit	Problem solving
19	Low	Low	High	High	Low	Low	High	High	Non-profit	Creative
20	Low	High	Low	Low	Low	Low	High	High	Non-profit	Problem solving

Table 8 *Complete dataset – To respect the anonymity of the interviewees and the organizations, no data on prize money or quantity of submissions is provided.*

4.2.3 USABILITY

The usability scores of the outcomes of the innovation contests were higher than the scores of the outcomes of the other quality dimensions among both the objective and subjective results. In total, 10 of the innovation contests were scored high on usability outcome in the objective scores while 11 of the innovation contests scored high on usability outcome in the subjective scores. Interesting is the fact that in 1 innovation contest the objective usability score of the outcome was high while the subjective usability score of the outcome in the innovation contest was low and in 2 innovation contests it was the other way around. Interviewee #1 and interviewee #14 were satisfied with the usability score of the outcomes despite only a small number of the submissions being usable in both innovation contests (IC#1 & IC#14). "If one asks a very open question to a non-controlled target group, then I find the ratio 5 or 6 on about 80 submissions above expectation" (IC#14). On the contrary, interviewee #16 was not pleased with the usability outcome of the submissions despite a larger part of the submissions scoring high on objective usability (IC#16). Interviewee #16 had looked at the submissions in two steps, first whether the submissions meet the question and second to what degree the submissions score on quality of the content (IC#16). For the outcome to score high on usability in this research, the submissions were supposed to be complete and thus answering all aspects. The quality of the content was not considered. For this reason, the objective usability outcome was scored high in IC#16 while the subjective usability outcome was scored low. Another example is interviewee #4 who indicated that their high subjective usability score was based on the combination of submissions which were completely worked out into details as well as submissions which were bluntly yet complete (IC#4). Due to the many submissions which were usable in IC#4, the objective usability was scored high as well. Just one innovation contest scored all submissions (>150) usable, while 40 submissions were regarded as actually interesting for potentially winning the innovation contest (IC#6).

The number of pages or the size of the submissions played a role in scoring the usability as well. Interviewee #15: "Some submissions had a very clear description, the majority of the lot. Others had used only one page to work out their idea" (IC#15). Interviewee #20 supported the statement by interviewee #15 by mentioning that the number of pages also was the bottleneck for usability scores among the submissions in their contest: "Presenting your idea on one page is rather limiting, it provides a wide spectrum of ideas but the usability was unsatisfying" (IC#20). The objective usability outcome scores and the subjective usability outcome scores among the dataset have resulted in some innovation contests in which a lot of usable submissions were provided or even all (IC#6), while some regarded none of the submissions as usable (IC#9). Summarizing, the usability outcome scores have scored overall higher than the other quality dimensions despite still only about half of the innovation contests retrieving an outcome which scores high on the usability of the outcome within innovation contests.

4.3 TASK COMPLEXITY

Among the innovation contests in the dataset are 7 innovation contests indicated as having a high task complexity while the other 13 innovation contests are indicated as having a low task complexity. Several examples of high task complexity innovation contests and low task complexity innovation contests are provided below. No innovation contest ID numbers are provided to ensure the privacy of the initiators.

An example of an innovation contest which was scored as having a high task complexity was scored as high due to the many aspects within the task which were connected and dependent on each other. A complete new smart turn around process for handling infrastructure was asked in which the contributors had to consider many phases within the process. Another innovation contest with a high task complexity was initiated by a municipality which wanted to reduce the number of students who travel during rush hour. There were many elements within the several subtasks such as the geographical location and public transport which were related and the innovation contest was therefore scored high on task complexity. The tasks among innovation contests with a low task complexity differed as well, e.g. one innovation contest asked the contributors to think about new ways of decreasing the intake of alcohol beverages among young people. Since it only concerned one task with one subtask, it was scored as low on task complexity. Another innovation contest with a low task complexity wanted the contributors to come up with new ways of making a specific area more attractive for visitors. It was asked to design a route among set landmarks which were all very clear and only a few elements within the tasks were related, therefore it was scored low on task complexity as well.

The propositions regarding the task complexity in relation to the quality indicators expected two negative relations and one positive relation among them. It was expected that the task complexity of an innovation contest (1) negatively influences the feasibility of the outcome, (2) positively influences the novelty of the outcome and (3) negatively influences the usability of the outcome within innovation contests. The results of testing the propositions are provided in the coming sections.

4.3.1 FEASIBILITY

Figure 4 and figure 5 show the results of the objective feasibility and the subjective feasibility of the outcome in relation to the task complexity of the innovation contests. The numbers in the different quadrants represent the ID number of each innovation contest. As one can see, only one innovation contest in both figures is placed in Q1. IC#18 is the only innovation contest which has an outcome that scored high on objective feasibility and subjective feasibility while having a high complexity task. Opposed to IC#18, 6 innovation contests with a high complexity task have scored low on both objective feasibility and subjective feasibility in Q3. The figures show quite evenly dispersed data measurements in Q2 and Q4, representing innovation contests with a low complexity. Based on the theoretical framework it was expected for the innovation contests to score high on feasibility in innovation contests with a low task complexity (Q2) and to score low on feasibility in innovation contests with a high task complexity (Q3). Due to the many innovation contests in both low feasibility and high feasibility among low task complexity innovation contests (Q2 and Q4) in figure 4 and figure 5, no support is found to support the expectation of low task complexity leading to a high feasibility outcome in innovation contests. Among innovation contests with a high task complexity, the data does support the proposition that a high task complexity results in a low score of feasibility in the outcome. This is due to the high amount of innovation contests in Q3 as opposed to only one innovation contest in Q1 in both figures. For this reason, it is stated that it is more likely for innovation contests with a high task complexity to retrieve an outcome with a low feasibility. Yet for innovation contests with a low task complexity no evidence is found to support the proposition. Therefore, the initial proposition is partly supported, only among innovation contests with a high task complexity.

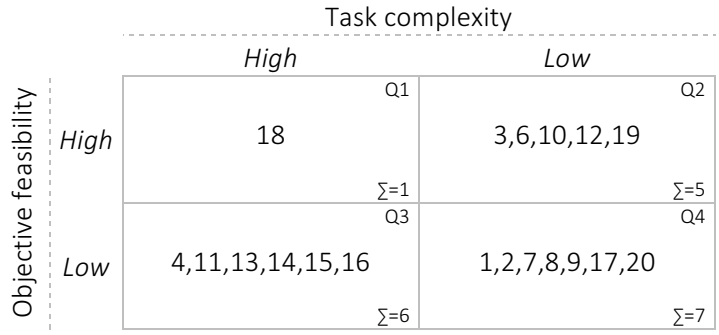

Figure 4 *Task complexity & objective feasibility – no data on IC#5 was available.*

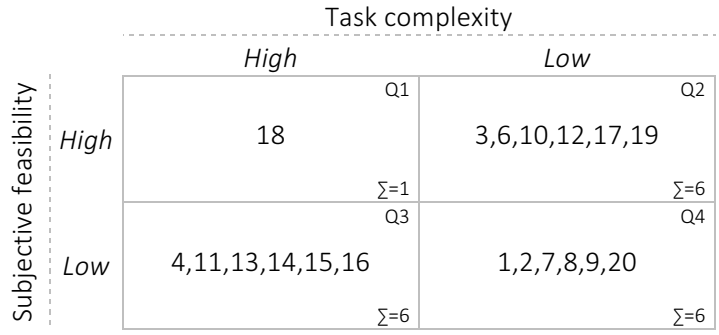

Figure 5 *Task complexity & subjective feasibility – no data on IC#5 was available.*

4.3.2 NOVELTY

The novelty of the submissions in innovation contests in relation to the task complexity is illustrated in figure 6 and figure 7. It was expected that submissions within an innovation contest with a low complexity task would score low on novelty while the submissions in an innovation contest with a high complexity task would score high on novelty. Thus, to support this proposition, figure 6 and figure 7 needed to have illustrated a lot of innovation contests in Q1 and Q4. Both figures show Q4 having 8 innovation contests in total which have scored low on novelty in low complexity tasks as opposed to Q2 which shows 4 innovation contests that have scored high on novelty in low complexity tasks. As there are multiple innovation contests in Q2 and Q4, no evidence is found for a low task complexity resulting in a low novelty outcome within innovation contests. The innovation contests with a high task complexity show differences in objective novelty and subjective novelty of the outcome in Q1 and Q3. 2 innovation contests score high on subjective novelty while scoring low on objective novelty, IC#13 and IC#15. This results in Q1 having more innovation contests than Q3 in figure 7, yet figure 6 shows more innovation contests in Q3 than in Q1. As there is no clear distinction in whether high task complexity innovation contests result in a low or high novelty outcome within the innovation contest and due to several innovation contests in both Q1 and Q3, no support is found for a high task complexity leading to high scores in novelty. Concluding, because of the widely dispersed innovation contest across all quadrants, the proposition on the positive influence of task complexity on novelty outcome within innovation contests is rejected.

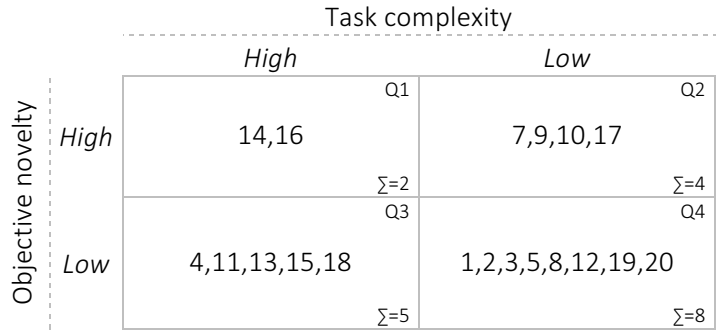

Figure 6 *Task complexity & objective novelty – no data on IC#6 was available.*

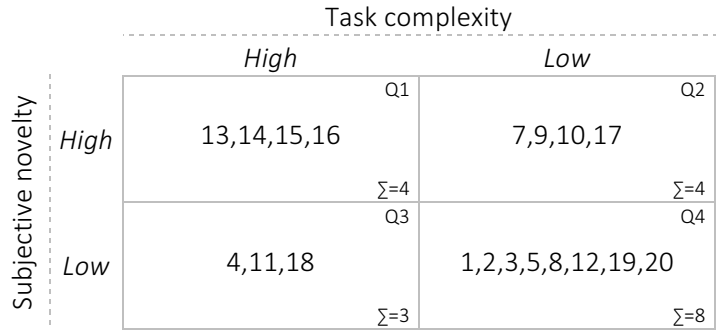

Figure 7 *Task complexity & subjective novelty – no data on IC#6 was available.*

4.3.3 USABILITY

Figure 8 and figure 9 illustrate the objective usability scores and subjective usability scores of the innovation contests. The proposition expected that innovation contests with a high task complexity would lead to an outcome with a low usability while innovation contests with a low task complexity were expected to result in an outcome with a high usability. Thus, in order to support the proposition, Q2 and Q3 needed to show the larger part of the innovation contests. Yet, both figure 8 as figure 9 show a wide spread of usability scores among innovation contests with a low task complexity and innovation contest with a high task complexity. All quadrants show at least three innovation contests which implies that the task complexity of an innovation contest is not likely to influence the outcome in objective usability or in subjective usability.

Two interviewees provided insights in what they had expected in relation to the influence of the task complexity in their task design with the outcome of the usability within innovation contests. Interviewee #13 mentioned that a complete [usable] answer to the posed question was nearly impossible as there were so many element which related to each other within the question (IC#13). Interviewee #16, who was not satisfied with the usability of the submissions despite a larger part of the submissions being usable, mentioned that the high complexity of the task had probably resulted in a lower quality of the submissions (IC#16). It was thus experienced by interviewee #16 that a high complexity might have negatively influenced the usability of the submissions (IC#16) which was in line with the expected proposition. Despite the support for the expected mechanisms by these two interviewees, the results in figure 8 and 9 provide no support for the expected negative influence of task complexity on the usability of the outcome in innovation contests. Therefore, the proposition is rejected.

Objective usability	Task complexity: *High*	Task complexity: *Low*
High	Q1 4,15,16,18 ∑=4	Q2 5,6,10,12,19,20 ∑=6
Low	Q3 11,13,14 ∑=3	Q4 1,2,3,7,8,9 ∑=5

Figure 8 *Task complexity & objective usability – no data on IC#17 was available.*

Subjective usability	Task complexity: *High*	Task complexity: *Low*
High	Q1 4,14,15,18 ∑=4	Q2 1,5,6,10,12,19,20 ∑=7
Low	Q3 11,13,16 ∑=3	Q4 2,3,7,8,9 ∑=5

Figure 9 *Task complexity & subjective usability – no data on IC#17 was available.*

4.4 TASK SPECIFICITY

The task specificity of the innovation contests among the dataset is evenly split in 10 innovation contests with a high task specificity and 10 innovation contest with a low task specificity. The specificity of a task, as mentioned in the methodological framework, have been indicated as high if a significant amount of preconditions and limitations were provided by the initiator.

A high task specificity was indicated e.g. in an innovation contest which aimed for a portable air filter as the task description mentioned several specific design requests such as it needing to be a fashion item, air filtering, making use of organic material to filter the air and it could weigh only 2 kilograms. Another high task specificity innovation contest was looking at what patients would like to have in their online portal to GP's, thereby imposing them that the portal should not increase the workload, it shouldn't be a replacement for the actual contact and it should be fast, simple and clear. A low task specificity was scored e.g. in an innovation contest in which the contributors were challenged to come up with a new marketing campaign. There were a few limitations provided but the contributors were most of all encouraged to get creative. Another low task specificity innovation contest was looking for ways of attracting more organizations to participate in their program. Once more, only a few limitations were given which did not restrict the contributors.

The task specificity of a task in an innovation contest may influence the quality of the submissions in three ways, 2 positive relations and 1 negative relation. It was expected that the task specificity of an innovation contest (1) positively influences the feasibility of the outcome,

(2) negatively influences the novelty of the outcome and (3) positively influences the usability of the outcome. The results of testing the propositions are provided in the coming sections.

4.4.1 FEASIBILITY

The objective feasibility outcome scores within innovation contests are shown in figure 10, while the subjective feasibility outcome scores within innovation contests are shown in figure 11. In relation to the feasibility of the outcome within innovation contests, it was expected that an innovation contest with a high task specificity would result in a high feasibility of the outcome, thus leading to many innovation contests in Q1 in figure 10 and 11. In line with this, an innovation contest with a low task specificity would result in a low feasibility outcome within innovation contests, meaning a lot of innovation contests in Q4. Both figures show a dispersion of all innovation contests among all four quadrants. Each quadrant has at least three innovation contests which means no conclusions can be drawn regarding the influence of task specificity on either objective feasibility or subjective feasibility of the outcome in innovation contests.

One interviewee provided an insight in their argument for making the task specificity high: "We explicitly put several specific details in the task as otherwise they would not be suitable to put them to practice. Otherwise you would receive ideas which are not feasible at all. Another time we had the crowd think about anything possible, yet now it was time to focus" (IC#2). This statement would support the mechanism of the initial proposition. Despite including a high task specificity within the innovation contest of IC#2, the outcome resulted in a low feasibility.

Objective feasibility \ Task specificity	*High*	*Low*
High	Q1: 10,12,18 ∑=3	Q2: 3,6,19 ∑=3
Low	Q3: 2,4,11,15,16,20 ∑=6	Q4: 1,7,8,9,13,14,17 ∑=7

Figure 10 *Task specificity & objective feasibility – no data on IC#5 was available.*

Subjective feasibility \ Task specificity	*High*	*Low*
High	Q1: 10,12,18 ∑=3	Q2: 3,6,17,19 ∑=4
Low	Q3: 2,4,11,15,16,20 ∑=6	Q4: 1,7,8,9,13,14 ∑=6

Figure 11 *Task specificity & subjective feasibility – no data on IC#5 was available.*

4.4.2 NOVELTY

Figure 12 and figure 13 show the results of the novelty outcomes within innovation contests with both low specificity tasks and high specificity tasks. According to the proposition it was expected that most innovation contest would be observed in Q2 and Q3. A low task specificity was expected to result in a high novelty outcome within the innovation contest and an innovation contest with a high task specificity was expected to result in a low novelty outcome. Q2 represents a low task specificity task and a high novelty outcome, yet no convincing amount of innovation contests can be observed. Furthermore, as several innovation contests are also present in Q4, it is not likely that a low task specificity influences the novelty outcome within innovation contests. The outcomes of innovation contests with a high task specificity are plotted in Q1 and Q3. Q1 shows a low amount of innovation contests with a high novelty outcome in comparison to Q3 which shows a high amount of innovation contests with a low novelty outcome. Despite the differences in Q1 and Q3 in figure 12 and figure 13, the results among innovation contests with a high task specificity do provide an indication for high task specificity innovation contests resulting in low novelty outcomes within innovation contests. For this reason, the proposition regarding the negative influence of task specificity on novelty of the outcome within innovation contests is only supported in innovation contests with a high task specificity.

An example of how an initiator thought about the influence of task specificity on novelty was provided by interviewee #8. Interviewee #8 had thought about how specific their task should be as they had expected that people would come up with creative and innovative ideas if you would set up a nonspecific task (IC#8). This argument supports the proposition, yet unfortunately for IC#8, their low task specificity did not result in a high score in novelty in the outcome.

Objective novelty	Task specificity: *High*	Task specificity: *Low*
High	Q1: 10,16 ∑=2	Q2: 7,9,14,17 ∑=4
Low	Q3: 2,4,5,11,12,15,18,20 ∑=8	Q4: 1,3,8,13,19 ∑=5

Figure 12 *Task specificity & objective novelty – no data on IC#6 was available.*

Subjective novelty	Task specificity: *High*	Task specificity: *Low*
High	Q1: 10,15,16 ∑=3	Q2: 7,9,13,14,17 ∑=5
Low	Q3: 2,4,5,11,12,18,20 ∑=7	Q4: 1,3,8,19 ∑=4

Figure 13 *Task specificity & subjective novelty – no data on IC#6 was available.*

4.4.3 USABILITY

The scores of the objective usability and subjective usability of the outcomes within innovation contests are shown in figure 14 and figure 15. It was expected that innovation contests with a low task specificity would lead to outcomes with a low usability (Q4) while innovation contest with a high task specificity would result in outcomes with a high usability (Q1). As is shown in Q1 in both figures, a lot of innovation contests which had a high specificity task had an outcome with a high usability. Furthermore, Q4 in figure 14 shows that among innovation contests with a low task specificity a large amount of innovation contests had a high objective usability outcome. Q2 and Q4 in figure 15 show a less evident difference in usability outcome across innovation contests with a low task specificity. Yet, as this research considers both the objective quality dimension measure and the subjective quality dimension measure for drawing conclusions on expected influences it is more likely for innovation contests with a low task specificity to have a low usability outcome. Thus, support is found for the expected proposition as the results of figure 14 and figure 15 combined indicate that the task specificity positively influences the usability of the outcome within innovation contests.

A possible explanation for the expected relation between task specificity and usability was provided by interviewee #18: "In the end, you are aiming for usable submissions, whether it is novel or in line with what you expected, I do not really care... If one would not make it specific, then the submissions can become anything, it could be vague or shallow yet if you make it specific … one hopes for submissions which are as close as possible to what you are looking for" (IC#18). Interviewee #10 had a likewise argumentation by mentioning that if one would have been non-specific then the sky would have been the limit and submissions would be send in which would not be usable at all (IC#10).

Objective usability \ Task specificity	*High*	*Low*
High	Q1: 4,5,10,12,15,16,18,20 ∑=8	Q2: 6,19 ∑=2
Low	Q3: 2,11 ∑=2	Q4: 1,3,7,8,9,13,14 ∑=7

Figure 14 *Task specificity & objective usability – no data on IC#17 was available.*

Subjective usability \ Task specificity	*High*	*Low*
High	Q1: 4,5,10,12,15,18,20 ∑=7	Q2: 1,6,14,19 ∑=4
Low	Q3: 2,11,16 ∑=3	Q4: 3,7,8,9,13 ∑=5

Figure 15 *Task specificity & subjective usability – no data on IC#17 was available.*

4.5 COMBINATION OF TASK CHARACTERISTICS

This research has focused on the direct effects of two task characteristics on three quality dimensions of the outcome in innovation contests. It has been researched how task complexity and task specificity individually influence the feasibility, novelty or usability of the outcome within an innovation contest. The previous sections have provided support for only one proposition while two propositions have been partly supported. The expected influences where thus only partly present. An interaction effect between the two task characteristics may result in more clear influences of the task design on the quality dimensions of the outcome within innovation contests. Thereby, an interaction of the two task characteristics may provide a different interpretation of the outcomes of the quality dimensions.

As is shown in figure 16, all combinations of high and low task complexity and high and low task specificity are present within the dataset despite them not being evenly dispersed. Only 2 innovation contests have a high task complexity and a low task specificity while 5 innovation contests have a low task complexity and a high task specificity. Furthermore, 8 innovation contests have a low task complexity and task specificity while 5 innovation contests have high task complexity and high task specificity. Each interaction between task complexity and task specificity on the quality indicators are tested in the sections below.

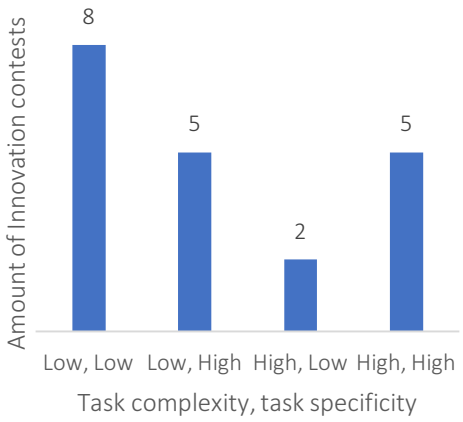

Figure 16 *Combination of task characteristics*

4.5.1 FEASIBILITY

Figure 17 and figure 18 show the results of the innovation contests in relation to the objective feasibility outcome and the subjective feasibility outcome within the innovation contests. Each quadrant represents the total of innovation contests with the related high or low task complexity and high or low task specificity. Within the quadrant, the innovation contests are split up in either high or low depending on whether the innovation contest had a high or low quality dimension outcome within the innovation contest. Q1 represents the 5 innovation contests with a high task complexity and a high task specificity, Q2 represents the 5 innovation contests with a low task complexity and a high task specificity, Q3 represents the 2 innovation contests with a high task complexity and a low task specificity and Q4 represents the 8 innovation contests with a low task complexity and a low task specificity. Because of the absence of data on feasibility in IC#5, no data is shown on IC#5 in figure 17 and figure 18.

In line with the propositions mentioned in the theoretical framework, one would expect the feasibility to score high in Q2 because of the expected negative influence of task complexity on the feasibility of the outcome in combination with the expected positive influence of the task specificity on the feasibility of the outcome in innovation contests. For the same reasons, it was expected that the innovation contests would score low in Q3. There were no expectations on either high or low outcome scores in Q1 and Q4.

The results in figure 17 and figure 18 show dispersed innovation contests across and within Q2 and Q4, meaning that the combination of a low task complexity with either a high or low task

specificity within an innovation contest does not result in a specific feasibility outcome within innovation contests. Furthermore, one might argue that the interaction effect of a high task complexity with a low task specificity is more likely to result in a low feasibility outcome within innovation contests as is shown in Q3. Additionally, one might argue that the interaction effect of a high task complexity with a high task specificity is also more likely to result in a low feasibility outcome within innovation contests as is shown in Q1. However, it is more likely that the low feasibility scores within Q1 and Q3 are the result of the direct influence of a high task complexity on the feasibility outcome within innovation contests as was found in the initial analysis of the direct effects. Therefore, it is concluded that there is no interaction effect of task complexity with task specificity on the feasibility outcome within innovation contests.

Objective feasibility

Task specificity	Task complexity: *High*			Task complexity: *Low*		
High			Q1			Q2
	High	18	∑=1	High	10,12	∑=2
	Low	4,11,15,16	∑=4	Low	2,20	∑=2
Low			Q3			Q4
	High		∑=0	High	3,6,19	∑=3
	Low	13,14	∑=2	Low	1,7,8,9,17	∑=5

Figure 17 *Interaction task characteristics & objective feasibility*

Subjective feasibility

Task specificity	Task complexity: *High*			Task complexity: *Low*		
High			Q1			Q2
	High	18	∑=1	High	10,12	∑=2
	Low	4,11,15,16	∑=4	Low	2,20	∑=2
Low			Q3			Q4
	High		∑=0	High	3,6,17,19	∑=4
	Low	13,14	∑=2	Low	1,7,8,9	∑=4

Figure 18 *Interaction task characteristics & subjective feasibility*

4.5.2 NOVELTY

Figure 19 and figure 20 illustrate the results of the innovation contests in relation to the subjective novelty and the objective novelty outcomes. As in figure 17 and 18, the four quadrants represent the different combinations of high and low task complexity and high and

low task specificity. The novelty outcome scores are shown as either high or low within each quadrant. The data on IC#6 was not available and therefore IC#6 is not shown within figure 19 and figure 20.

Due to the proposed positive effect of task complexity on novelty outcomes in innovation contests and the proposed negative effect of task specificity on novelty outcomes in innovation contests, low novelty scores were expected in Q2. For the same proposed influences, it was expected that Q3 would show high novelty outcome scores. There were no expectations on either high or low outcome scores in Q1 and Q4.

The novelty outcome scores in figure 19 and figure 20 show slightly different results. Q3 in figure 20 illustrates that the interaction effect of task complexity and task specificity seem to result in high subjective novelty outcomes while Q3 in figure 19 does not show an interaction effect of task complexity and task specificity on either high or low objective novelty scores. Q4, in both figures, illustrates that a low task complexity in combination with a low task specificity does not result in low or high novelty outcomes within innovation contests. One might argue that Q1 and Q2 illustrate that the interaction effect of low task complexity with high task specificity and the interaction effect of high task complexity with high task specificity result in low novelty outcomes within innovation contests. Yet, it should be noted that these indications should be interpreted the same as the earlier found influence of high task specificity on the novelty outcomes within innovation contests. All in all, no clear interaction effects of task complexity with task specificity on novelty are found throughout the dataset.

Objective novelty

Task specificity	Task complexity: *High*			Task complexity: *Low*		
			Q1			Q2
High	High	16	∑=1	High	10	∑=1
	Low	4,11,15,18	∑=4	Low	2,5,12,20	∑=4
			Q3			Q4
Low	High	14	∑=1	High	7,9,17	∑=3
	Low	13	∑=1	Low	1,3,8,19	∑=4

Figure 19 *Interaction task characteristics & objective novelty*

Subjective novelty

Task specificity	Task complexity: *High*			Task complexity: *Low*		
			Q1			Q2
High	High	15,16	∑=2	High	10	∑=1
	Low	4,11,18	∑=3	Low	2,5,12,20	∑=4
			Q3			Q4
Low	High	13,14	∑=2	High	7,9,17	∑=3
	Low		∑=0	Low	1,3,8,19	∑=4

Figure 20 *Interaction task characteristics & subjective novelty*

4.5.3 USABILITY

The subjective usability and objective usability outcome scores of the innovation contests in relation to the combinations of the task complexity and task specificity are illustrated in figure 21 and figure 22. Once more, each innovation contest is sorted in the corresponding quadrant and put high or low depending on the usability outcome of the innovation contest. IC#17 is not shown because of the absence of data on usability within IC#17.

The direct effects proposed a negative influence of task complexity on the usability outcome within innovation contests and a positive influence of task complexity on the usability outcome within innovation contests. These proposed effects would result in high usability scores within Q2 and low usability scores within Q3. No expectations were constructed for high or low scores in Q1 and Q4.

Figure 21 and figure 22 show different results in Q1, Q3 and Q4 due to interviewees scoring the subjective usability of the outcome different from the objective usability as explained in 4.4.3. Based on figure 21 and figure 22, it might be argued that Q1 and Q2 indicate that the interaction effect of high task complexity with high task specificity and the interaction effect of low task complexity with high task specificity result in high usability outcomes. Additionally, Q3 in figure 21 shows that the interaction effect of high task complexity and low task specificity results in low objective usability outcome within innovation contests. Furthermore, it might be argued that Q4 in figure 21 and Q3 and Q4 in figure 22 illustrate that no interaction effects on the usability outcome within innovation contests are found within these quadrants. However, if the results of figure 21 and figure 22 are combined then the results provide support for the earlier found positive influence of task specificity on the usability outcome within innovation contests. Therefore, it is concluded that no interaction effects are present in relation to the usability outcome within innovation contests.

Objective usability

Task specificity	Task complexity: *High*			Task complexity: *Low*		
High			Q1			Q2
	High	4,15,16,18	∑=4	High	5,10,12,20	∑=4
	Low	11	∑=1	Low	2	∑=1
Low			Q3			Q4
	High		∑=0	High	6,19	∑=2
	Low	13,14	∑=2	Low	1,3,7,8,9	∑=5

Figure 21 *Interaction task characteristics & objective usability*

Subjective usability

Task specificity	Task complexity: *High*			Task complexity: *Low*		
High			Q1			Q2
	High	4,15,18	∑=3	High	5,10,12,20	∑=4
	Low	11,16	∑=2	Low	2	∑=1
Low			Q3			Q4
	High	14	∑=1	High	1,6,19	∑=3
	Low	13	∑=1	Low	3,7,8,9	∑=4

Figure 22 *Interaction task characteristics & subjective usability*

4.6 OVERVIEW OF RESULTS

Figure 23 illustrates the findings on the propositions within this research. As is shown, only one proposition is fully supported while two propositions are partly supported. No evidence for supporting proposition 2, proposition 3 and proposition 4 was found and they are therefore rejected. The analyses on the interaction effects of task complexity and task specificity on the quality dimensions of the outcome within innovation contests have not shown any convincing evidence of the presence of interaction effects.

Task characteristic		Expected influence	Quality dimension	Result
Task complexity	P1	Negative	Feasibilty	Partly supported: High task complexity results in low feasibilty outcome
	P2	Positive	Novelty	Rejected
	P3	Negative	Usability	Rejected
Task specificity	P4	Positive	Feasibilty	Rejected
	P5	Negative	Novelty	Partly supported: High task specificity results in low novelty outcome
	P6	Positive	Usability	Supported: Task specificity positively influences the usability outcome

Figure 23 *Results of expected propositions*

4.7 ADDITIONAL ANALYSES

This research has focussed on the influence of the task design on different quality dimensions of the outcome within innovation contests. Yet, as the initial analyses on the influence of the task characteristics did not provide much support for the proposed relations other output dimensions were researched as well. As quantity of submissions has been used in other research studies as a quality dimension, this research has tested whether the task complexity and the task specificity influence the quantity of the submissions within the innovation contests which are used in this research.

As previously mentioned, the quantity of the submissions across all innovation contests in this research differs from 40 as the lowest amount, 184 as the highest number of submissions and about 86 submissions as the average across all innovation contests. To research whether task complexity or task specificity influence the quantity of submissions within innovation contests independent sample T tests have been executed. An independent sample T test looks at whether a significant distinction can be made between the means of two groups. The independent sample T test may show whether a high task complexity or high task specificity leads to either more or less submissions in comparison to low task complexity and low task specificity.

An independent sample T-test was conducted to compare quantity of submissions for low task complexity and high task complexity in innovation contests. On average, the crowd was more likely to contribute to innovation contests with a low task complexity (M=97.38, SE=13.86) than to innovation contests with a high task complexity (M=65.00, SE=7.77). This difference was significant $t(18) = 1.62$, $p < 0.1$. It represented a medium-sized effect $r = 0.44$. The output of the independent sample T-test is provided in appendix B.

An independent sample T-test was also conducted to compare the quantity of the submissions for low task specificity and high task specificity in innovation contests. On average, the crowd was more likely to contribute to innovation contests with a low task specificity (M=89.30, SE=16.394) than to innovation contests with a high task complexity (M=82.80, SE=12.031). This difference was not significant $t(18) = .33$, $p > .10$. It represented a small-sized effect $r = 0.08$. The output of the independent sample T-test is provided in appendix C.

The task complexity thus seemed to have a significant ($p < 0.1$) influence on the quantity of the submissions, meaning that an innovation contest with a high task complexity is likely to receive less submissions than innovation contests with a low task complexity.

4.8 ADDITIONAL INSIGHTS

The semi-structured interviews have provided some additional insights as multiple interviewees mentioned the same phenomenon. The interviewees stated that they felt as if the contributors had different motives for submitting an idea within innovation contests. The interviewees thought that some contributors were submitting several ideas just hoping to win a part of the prize money instead of contributing with one submission of a high quality. For this reason, it was tested whether the quality of the outcome was related to the prize money within the innovation contests. However, no relation was found and therefore it is not likely that the amount of prize money directly influences the quality of the outcome within innovation contests.

Another additional insight was found in the influence of the task complexity on the feasibility of the outcome within innovation contests. Only 6 initiators had scored the feasibility outcome of their innovation contests high in objective feasibility while 7 had scored the feasibility outcome of their innovation contest high in subjective feasibility. 5 out of 6 and 5 out of 7 of these innovation contests were organised by a non-profit organization. Thus, this means that profit organizations might be more likely to score the feasibility of the outcome low. Within all other direct influences, the profit and non-profit organizations were dispersed across both high and low scores of the quality dimensions. Also, the purpose of initiating an innovation contest either as problem solving or creative did not influence the scores of the quality dimensions in the outcomes. No evidence was found in any analysis for a problem-solving innovation contest scoring differently on any quality dimensions than a creative innovation contest.

5. DISCUSSION & CONCLUSION

This chapter discusses the results of the analyses within this research and aims to provide insights in why some of the propositions were partly supported or supported and why some of the propositions were rejected. Furthermore, theoretical and managerial implications are provided which will be followed up by limitations and recommendations for future research. The conclusion at the end answers the posed research question of this thesis.

5.1 DISCUSSION OF THE RESULTS

5.1.1 QUALITY DIMENSIONS

This research has focussed on the influence of task characteristics in the task design of an innovation contest on the quality of the outcome within an innovation contest. The quality of the outcome has been researched by looking at three different quality dimensions, being the feasibility, novelty and usability. Despite only one fully supported proposition and two partly supported propositions, it was made clear that the task complexity and the task specificity of an innovation contest are of influence on the three different quality dimensions of the outcome within innovation contests. The results showed that the quality dimensions which were used in this research to look at the outcome of innovation contests in relation to the task complexity and task specificity are relevant and need to be considered when scoring the outcome of innovation contests.

5.1.2 TASK COMPLEXITY

The results on the influence of task complexity on the three different quality dimensions provided insights in whether the proposed influences were supported. The task complexity does not seem to have a strong influence on the quality of the outcome within innovation contests as only one proposition has been partly supported.

The negative influence of task complexity on the feasibility of the outcome within innovation contests was supported among innovation contests with a high task complexity. A high task complexity is more likely to result in a low feasibility outcome because a high task complexity will result in a high cognitive demand and thereby make it more challenging for contributors to come up with submissions which can be easily implemented.

Among innovation contests with a low task complexity no influence was found as low task complexity innovation contests resulted in both low feasibility and high feasibility outcomes within the innovation contests. Furthermore, the proposed influences of task complexity on the usability outcome and novelty outcome within innovation contests were also not supported. A possible explanation for both high feasibility and low feasibility outcomes in low task complexity innovation contests might be due to different ways in which the level of task complexity is perceived. Some contributors might experience the level of task complexity as a challenge for coming up with something feasible, novel or usable while others do not experience the level of task complexity as an obstacle at all for coming up with a high-quality idea.

Overall, it thus seemed to be as if the influence of task complexity within the task design of innovation contests on the outcome was almost non-existent. Yet, the results on the influence of task complexity on the quantity of submissions within innovation contests showed that the task complexity has a negative influence on the quantity of submissions. A high task complexity

innovation contest is likely to receive less submissions than a low task complexity innovation contest. Therefore, it is stated that in line with the results of this research it appears that the influence of the task complexity is of greater influence on the *motivation* of the contributors to submit an idea than on the quality of the submissions within innovation contests.

5.1.2 TASK SPECIFICITY

The task specificity of an innovation contest was supposed to positively influence the feasibility of the outcome within innovation contests by providing a specific scope for the desired ideas. However, the results show that low task specificity innovation contests and high task specificity innovation contests lead to both high feasibility outcomes and low feasibility outcomes. The task specificity is thus apparently not relevant for a specific score of feasibility of the outcome within innovation contests.

The expected negative influence of the task specificity on the novelty of the outcome within innovation contests was supported in innovation contests with a high task specificity. This result support Ward et al. (2004) in mentioning that a high task specificity results in people coming up with novel ideas based on the set limitations and the specifics which are provided. A negative influence of task specificity on the novelty outcome among innovation contests with a low task specificity was not supported by the results as both high novelty outcomes and low novelty outcomes were found. A low task specificity may result in high novelty outcomes as the contributors are not restricted in their thinking patterns. On the contrary, a low task specificity may result in low novelty outcomes as the contributors are not provided with specific information of what is already known within the organization of the initiator. Due to the lack of that specific information the contributors may come up with ideas that are not regarded as novel to the initiator.

The positive influence of task specificity on the usability of the outcome within innovation contests was supported by the results in this research. A high task specificity will mean specific design requests, limitations and preconditions within the task description which can reduce the uncertainty related to the task (Ye & Kankanhalli, 2013) and thereby provide clear instructions on how all aspects of the task need to be dealt with. On the other hand, a low task specificity will result in the contributors not knowing what is expected and how all aspects of the task need to be dealt with and thereby result in a low usability.

All in all, the task specificity is a relevant indicator for the quality of the outcome within innovation contests, especially in relation to the usability of the outcome. No evidence was found for a significant influence of the task specificity on the quantity of submissions in innovation contests.

5.2 THEORETICAL IMPLICATIONS

This study has focused on the relation between the task design of innovation contests and the quality of the outcome. Specifically, it was researched whether the task complexity and the task specificity influence the quality of the outcome within innovation contests. The task complexity appears to have a minor influence on the quality of the outcome within innovation contests. This research did provide evidence for the influence of task complexity on the quantity of submissions of the outcome within innovation contests. The influence of task specificity on the

quality of the outcome within innovation contests was proven to be present in relation to the novelty and the usability of the outcome within innovation contests.

Previous research has shown how initiators can motivate contributors through reward structures (Brabham, 2010) and have provided insights in how experience among contributors may influence the outcome of an innovation contest (Füller et al., 2011). Yet, by focussing on different quality dimensions in relation to the outcome within innovation contests, it brings together literature on task design, the results of task design and crowdsourcing. The results of this research add to literature additional insights in how the task design of an innovation contests influences the outcome within innovation contests.

5.3 MANAGERIAL IMPLICATIONS

This research can be used by any organization who is planning to initiate an online innovation contest or is hoping to retrieve a higher quality outcome in a next innovation contest. In the process of designing the task for an innovation contest, an initiator needs to think of several task design aspects which might influence the performance of the contributors and therewith the outcome of the innovation contest. The managerial implications from this research are presented below.

First, the task complexity of an innovation contest is of influence on both the quality as the quantity of the submissions within innovation contests. This research showed a negative influence of task complexity on the feasibility of the outcome within innovation contests with a high task complexity. If an initiator desires a high feasibility outcome then it is more likely to retrieve this outcome with a task design which includes a low task complexity than with a task design which includes a high task complexity. Furthermore, if the initiator hopes for a high quantity of submissions then a low task complexity deems more evident than a high task complexity within the task design of the innovation contest. The initiator of an innovation contest therefore needs to take in mind that a low task complexity entails a small amount or no subtasks, elements and relationships among subtasks and elements within the task design of the innovation contest.

Second, the task specificity of an innovation contest is of influence on two quality dimensions of the outcome within innovation contests, being the novelty and the usability. If an initiator desires to retrieve a high novelty outcome then it is more likely to retrieve this outcome with a task design which includes a low task specificity than with a task design which includes a high task specificity. Furthermore, a high task specificity results in a high usability outcome within innovation contests and a low task specificity results in a low usability outcome within innovation contests. Initiators of innovation contests thus need to take in mind that integrating no to a few limitations, preconditions, design requests and details will likely result in a high novelty outcome but also a low usability outcome within the innovation contest.

5.4 LIMITATIONS & RECOMMENDATIONS FOR FUTURE RESEARCH

This thesis has aimed for a transparent methodological framework and has embedded the theoretical framework in the literature. However, some limitations can be marked throughout the research which are addressed in this section and will be followed up by recommendations for future research.

First, the *internal reliability* was influenced by the way in which the task characteristics of the innovation contests were scored. A pre-developed scheme with indicators for scoring both the task complexity and task specificity of the task description in the innovation contests was used. The researcher has scored the task descriptions of the innovation contests on task complexity and task specificity solely. The interviewees were asked to score the task description in their innovation contests as well to increase the internal reliability of this research. Yet, the interviewees found it challenging to provide an indication of the task complexity of their innovation contests. Interviewee #4 stated: "For me it is really hard to judge as we were really deep into the subject… If you would ask me whether it is intellectually challenging I would say no, but I am not sure whether that would be included in your definition" (IC#4). Another interviewee mentioned that the challenge was highly complex because it was about feelings and changing consciousness which is in its essence complex, however the formulation in the task was really simple (IC#8). The interviewees found it less challenging to score the task specificity but weren't always too sure about it either. Interviewee #18 mentioned that they intended to make the task specificity high but he was not sure whether the contributors found the task specificity high as well (IC#18). Another interviewee said that they had limited the scope of the innovation contest and thereby had increased the task specificity of the innovation contest, however they had not intended to make the task specific (IC#15). It thus appeared that the perceptions of the interviewees on the task characteristics were not reliable throughout the dataset. For this reason, only the task characteristics measures of the researcher were considered for the analyses.

Second, this research is limited due to the focus on the innovation contest as the only level of analysis. By integrating contributors in this research, it could have provided in-depth insights in how the task characteristics of the innovation contest were perceived in relation to the quality of the outcome within innovation contests. Future research could therefore take other units of analysis into account to provide additional insights in the influences of task complexity and task specificity on the quality of the outcome within innovation contests.

Third, this research has focussed on two task characteristics and their influence on the quality of the outcome within innovation contests. By looking at interaction effects and controlling for the purpose of initiating the contest and the type of organization, this research aimed to increase the internal validity. Yet, because of the focus on only two task characteristics being the task complexity and task specificity, this research has limited itself in finding influential aspects on the quality of the outcome within innovation contests. Therefore, future research may look into other influential aspects as the amount of background information which is given in the description of the task or the task analysability, meaning the extent to which a task involves a clearly defined sequence of steps and established procedures (Kim & Soergel, 2005, p. 11).

Fourth, despite a clear description of the used crowdsourcing platform in this research, the *generalizability* of this research needs to be considered as all innovation contests were organised making use of the same crowdsourcing platform. It could be interesting to research whether the results of this research are also found in innovation contests making use of different crowdsourcing platforms or not making use of crowdsourcing platforms at all.

Furthermore, future research could also focus on the follow-up plans of initiators after the innovation contests. Several initiators mentioned that they had not upfront thought about what to do with the outcome of the innovation contests and it sometimes resulted in the submissions not being used at all after the innovation contest. Others did have an execution budget but did not manage to do something with the outcome. One initiator mentioned that the innovation contest provided them with a small selected crowd which are consulted occasionally to help them with brainstorming or finding solutions to small problems. Thus, knowing how to deal with the outcome of an innovation contest might be interesting to research for initiators of innovation contests.

5.5 CONCLUSION

In this thesis, the effect of two task characteristics of innovation contests on the quality of the outcome within innovation contests was researched. The quality of the outcome within innovation contests was split up in three quality dimensions being the feasibility, novelty and usability of the outcome. As previous research has shown that organizations among public and private sectors frequently make use of innovation contests as a mechanism for eliciting innovation (Boudreau et al., 2011), it is relevant for initiators of innovation contest to know how the task design of an innovation contest influences different quality dimensions of the outcome within innovation contests. To know what the influence is of task characteristics on the quality of the outcome within innovation contests, the following research question was answered:

What is the influence of task complexity and task specificity on the quality of the outcome within an innovation contest?

Given all previous limitations, several conclusions can be drawn on the influence of task complexity and task specificity on the quality of the outcome within innovation contests. The task complexity negatively influences the feasibility of the outcome in innovation contests in innovation contests in which the task complexity is high. Additionally, no influences of task complexity on the novelty outcome or feasibility outcome within innovation contests were found. Furthermore, the task specificity negatively influences the novelty of the outcome within innovation contests in which the task specificity is high. Also, the task specificity positively influences the usability outcome within innovation contests resulting in a high usability outcome in innovation contests with a high task specificity and resulting in a low usability outcome in innovation contests with a low task specificity. At last, no influence of task specificity on the usability of the outcome within innovation contests was found.

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APPENDICES

APPENDIX A – TOPIC LIST IN DUTCH

Persoonlijke introductie

- Thesis
- Innovation sciences UU
- Aanleiding van dit onderzoek

Persoonlijke vragen initiator

- Wat is uw positie binnen XX en wat zijn uw voornaamste verantwoordelijkheden?
- Wat is uw persoonlijke mening over het gebruik van externe bronnen zoals in innovation contests? / Hoe denkt u over het gebruik van het publiek als informatiebron voor nieuwe concepten?
- Wordt er veel gebruik gemaakt van externe bronnen voor nieuwe concepten?
- Wat is de reden van het gebruik maken van innovation contests?

Innovation contest & taak beschrijving

- Wat was het doel van het organiseren van de innovation contest? Waarom werd deze opgezet?
- Welke partijen of afdelingen waren er betrokken bij het opzetten van de innovation contest?
- Hoe is de beschrijving van de taak tot stand gekomen? Team, 1 persoon?
- Naar wat voor oplossingen was het bedrijf op zoek?
- Waarom is er gekozen voor een innovation contest?
- Hoeveel weken heeft de innovation contest open gestaan en waarom deze termijn?
- Hoeveel inzendingen waren er? Ik heb gevonden dat er XX inzendingen waren.
- Wat vond u overal van de inzendingen? Waarom vond u dat?

Bruikbaarheid (Usability)

- Bruikbaarheid gaat over een compleet antwoord geven op de vraag en op alle aspecten een antwoord krijgen die binnen de vraag vallen
- Hoe bruikbaar waren de inzendingen? Was het merendeel bruikbaar of was het grootste gedeelte niet bruikbaar? Hoe lagen de verhoudingen op het totaal?
- Waarom waren de meeste inzendingen wel/niet bruikbaar? Wat maakte ze wel/niet bruikbaar?
- Hebben alle inzendingen alle aspecten van het probleem aangepakt of deden maar enkelen dat? Wat zorgde ervoor dat ze (niet) alle aspecten aanpakten? Heeft u enig idee wat ervoor zorgde dat niet alle aspecten werden aangepakt?

Toepasbaarheid (Feasibility)

- Toepasbaarheid gaat met name over de gemakkelijkheid van het implementeren van de aangeleverde concepten en het vertalen naar een commercieel product
- Hoe toepasbaar waren de inzendingen? Was het merendeel toepasbaar of was het grootste gedeelte niet toepasbaar? Hoe lagen de verhoudingen op het totaal?
- Waarom waren de meeste inzendingen wel/niet toepasbaar? Wat maakte ze wel of niet toepasbaar?

- Waren de inzendingen makkelijk te vertalen naar een implementeerbaar/commercieel product? Waarom wel/niet?
- Waren de inzendingen makkelijk te implementeren? Waarom wel/niet?

Nieuwigheid/nieuwheid (Novelty)

- Nieuwheid gaat over hoe nieuw ze waren voor u als organisator van de contest en voor uw organisatie
- Hoe nieuw/vernieuwend waren de inzendingen voor de organisatie? Was het merendeel nieuw of was het grootste gedeelte niet vernieuwend? Hoe lagen de verhoudingen op het totaal?
- Waarom waren de meeste inzendingen wel/niet nieuw? Wat maakte ze wel/niet nieuw?
- Hebben de inzendingen compleet nieuwe inzichten gegeven of was het merendeel al bekend/herkenbaar? Heeft u enig idee wat ervoor zorgde dat niet alles nieuw was?

Taak specificiteit (Task specificity)

- Zou u uw taak specifiek of niet specifiek noemen?

Binnen dit onderzoek wordt de specificiteit van een taak aangeduid als de mate waarin de opdrachtnemer vrijheid krijgt in het uitwerken van de taak/beantwoorden van het vraagstuk. Wanneer er een hoge mate van richtlijnen en specifieke details of wensen worden aangegeven, zal de specificiteit dus ook toenemen

- Zou u de taak, aan de hand van deze definitie, binnen de innovation contest specifiek noemen? Waarom?
- Waarom heeft u de taak (niet-) specifiek gemaakt?

Taak complexiteit (Task complexity)

- Zou u uw taak complex of niet complex noemen?

Binnen dit onderzoek worden complexe taken gedefinieerd als “taken met verschillende subtaken en elementen die in relatie tot elkaar staan en mogelijk tegenstrijdig zijn, waarbij degene die de vraag moet beantwoorden niet direct tot een eenduidig antwoord kan komen.

- Zou u de taak, aan de hand van deze definitie, binnen de innovation contest complex noemen? Waarom?
- Waarom heeft u de taak (niet-) complex gemaakt?

Additioneel

- Zou u in het vervolg nogmaals online innovatie wedstrijd? Waarom wel, niet?
- Is er nog iets gedaan met de aangeleverde concepten?
- Waarom is er gekozen voor deze beloning?
- Vond u het resultaat in verhouding tot de prijzen van de beloning?

Heeft u nog vragen over dit onderzoek of opmerkingen over de innovation contest in het algemeen? Zijn er nog dingen die niet aan het licht zijn gekomen?

APPENDIX B – OUTPUT INDEPENDENT SAMPLE T TEST TASK COMPLEXITY

Group Statistics

	Task complexity	N	Mean	Std. Deviation	Std. Error Mean
Submissions	0	13	97,38	50,099	13,895
	1	7	65,00	20,567	7,774

Table 9 *Group statistics task complexity*

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									90% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Submissions	Equal variances assumed	8,990	,008	1,622	18	,122	32,385	19,969	-2,242	67,011
	Equal variances not assumed			2,034	17,298	,058	32,385	15,922	4,715	60,055

Table 10 *Results independent sample T test task complexity*

APPENDIX C – OUTPUT INDEPENDENT SAMPLE T TEST TASK SPECIFICITY

Group Statistics

	Task specificity	N	Mean	Std. Deviation	Std. Error Mean
Submissions	0	10	89,30	51,844	16,394
	1	10	82,80	38,046	12,031

Table 11 *Group statistics task specificity*

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									90% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Submissions	Equal variances assumed	,995	,332	,320	18	,753	6,500	20,335	-28,763	41,763
	Equal variances not assumed			,320	16,514	,753	6,500	20,335	-28,936	41,936

Table 12 *Results independent sample T test task specificity*