Thesis

The effects of schema (in)consistency in ideation

A research towards the effect of exposure to schema (in)consistency on the number and creative quality of ideas generated by consumers in co-creation?

Name: R.T.A. (Ryon) Matton

Student number: S1028943

Email: Ryon.Matton@student.ru.nl

Draft: Final version

Date: 15th of June 2020

Supervisor: S.M Ritter

2nd examiner: N. Belei

Acknowledgements

After receiving my bachelor's degree at Avans University of Applied Sciences three years ago, I doubted if I was smart enough to also finish my master’s degree. Today I am confident that I will, but without the help and encouragement of several people I would not have gotten this far.

First, I would like to thank my parents Ruud and Jany Matton. My parents were always present during the hard times of education. They listened to my problems, tried to help me and calmed me down when I needed it.

Secondly, I want to thank my friends and study colleagues for the fun times during the stressful moments. I could always count on them when I needed a laugh.

Last but not least, a special thank you goes out to Simone Ritter, who supervised me during my thesis time. The feedback, directions of research and supporting comments helped me a lot. Working with her really improved the quality of my thesis.

I hereby proudly present my thesis research.

Ryon Matton

Table of content

Abstract

A main task for companies is to develop new products or services that fulfill customer needs. Customer co-creation has a significant effect on the success of new products. New Product Development has four phases: ideation, development of a product or service, testing and launching. Including customers in the ideation phase especially results in better products and less costs. The purpose of this research is to examine how to optimally involve customers in the ideation process. In other research it was proven that exposure to inconsistent schema had a positive effect on an individuals' creative and flexible thinking. This research tests if exposure to inconsistent schema pictures (compared to consistent schema pictures and no pictures) leads to more ideas and ideas of a higher creative quality. It thereby tests if individual creativity has a moderating effect on this relationship. The results found in this thesis are not in line with other researches that investigate the effects of schema inconsistencies. No significant results were found after analyzing the data, which lead to the conclusion that exposure to inconsistent pictures had no effect on the number and quality of ideas. This thesis tried to find a connection between schema theory and innovation research. Because there are no significant effects, this link was not found. These results are useful for companies because they need to know what the most effective way of doing New Product Development is. It is now known that the manipulation used in this research does not give the expected effects.

Keywords: schema theory, inconsistent schema, consistent schema, New Product Development, ideation, ideation contest.

1. Introduction

An important task for companies is to develop new products or services that meet the unfulfilled needs of customers. A need can be defined as "a difference between a desired and actual state, physical or psychological" (Hoyer et al., 2016, p. 48). Is it wise for companies to involve customers in creating new products? Some researchers do not think that it is. They believe that customers cannot imagine new technologies and only think in terms of what they have experienced themselves (Ulwick, 2002). Other researchers think that customer co-creation is very important to understand the customer (Kaplan & Haenlein, 2006; Hoyer et al., 2010; Mukhtar et al., 2012). Customer input is a significant factor in raising the chances of product success (Evanschitzky et al., 2012). Customer co-creation can thus be of added value. Companies must use customer co-creation in the right way for it to be effective, but what is the right way of applying customer co-creation? This thesis focuses on how to raise the number and quality of product ideas that are generated by customers, in order to make involving customers in co-creation even more useful than it is now.

1.1 Introduction to the research topic

New product development (NPD) is important for companies to retain their competitive position in the near future (Hillebrand et al., 2011). Success rates of new products are normally not that high; only 25% of the new product innovations can be rated as a success (Evanschitzky et al., 2012). NPD is defined as "the transformation of a market opportunity into a product available for sale" (Krishnan & Ulrich, 2001). Companies initiate NPD for two reasons. They either want to use NPD to increase demand or they want to create a whole new market (Johnson & Kirchain, 2011). NPD is a process consisting of (1) identification of an opportunity, (2) the development of a product/service, (3) testing that product or service and eventually (4) launch the new product or service (van Kleef et al., 2005). The traditional view of NPD, where companies need to come up with new ideas and decide what to bring to the market, is being discussed (Grönlund et al., 2010). Research provides arguments for the claim that customer co-creation (CC), defined as "a collaborative new product development (NPD) activity in which consumers actively contribute and select various elements of a new product offering" (Hoyer et al., 2010), ensures better products and lower costs (Fuchs & Schreier, 2010). A company cannot employ all intelligent people for itself (Chesbrough, 2003). This means that an organization must find a way to reach out to the knowledge that lies outside the organization. It is likely that, when a customer does not find what he or she wants on the market, he or she

will want to create this product him or herself (von Hippel, 2005, p. 5). Companies, spread over a number of industries, empower customers by letting them participate in processes previously done by marketing departments. CC can be seen in two dimensions: creating ideas for new products and selecting new product designs (Fuchs & Schreier, 2010). Compared to a study of Henard and Szymanski (2001) where customer input had no significant effect on the success of NPD, a study by Evanschitzky et al. (2012) shows that customer input is nowadays significant in making new products a success. Important to define is when a new product is a success. According to Cooper and Kleinschmidt (1987), product success is when a product performs financially (overall financial success), gains market share (the impact of the product on both domestic and foreign markets) and opens up new opportunities. It is also important to see how to benefit most from co-creation. How does one do that?

One way in which companies involve customers in NPD is by organizing online ideation contests: organizations post problems for which customers can find the answers (Yang et al., 2009). The goal of ideation contests is to reach out to high quality problem solvers, and to get qualitative good and diversified solutions that are also provided with the problem solvers' incentives and strategic actions (Yang et al., 2010). With this form of open innovations people from all over the world can provide ideas or potential solutions for the problems that organizations encounter (Yang et al., 2009). One of the challenges is, like stated by Steve Jobs (1998), that "people do not know what they want until you show it to them". In research by Ulwick (2002), about customer input in innovation, it is said that it can be hard for customers to think of new product ideas, imagine the use of new technologies and consider the use of different materials. Therefore, creative thinking is a very important factor in NPD (Bissola et al., 2013). Snyder et al. (2004) found proof that subconscious idea generation is more creative than conscious idea generation. Based on the research of Snyder et al. (2004) it can be stated that ideation contests can be more beneficial if the subconscious thoughts are addressed.

One of the subconscious processes is that people think in schemata (Woody & Phillips, 1995). A schema can be defined as "a knowledge structure in the head that is used in the storage of information" (Derry, 1996). These knowledge structures can change when schemata are violated. For companies these schema violations can be beneficial, for they generally stimulate favorable responses from consumers (Taylor & Noseworthy, 2019). Heinz purple ketchup is an example of a schema violating product. Heinz wanted to target young children and needed a new product for that (BBC news, 2000). In scientific research it is found that schema violations enhance creative thinking (Wan & Chiu, 2002; Neuschatz et al., 2002; Miron-Spektor et al., 2011; Ritter et al., 2012; Gocłowska et al., 2012). The development of Heinz green and purple

ketchup is an example of how schema violations enhance idea creativity. The product developers thought of a stimulus that did not fit in an already existing schema (thinking of different colors than red for ketchup). The exposure to this inconsistent schema lead to new product ideas (green and purple ketchup).

It can thus be concluded from other research that exposure to inconsistent schemata has a positive influence on the creative thinking of individuals. Exposure to inconsistent schemata could thereby have this influence on the quality of ideas generated by customers in co-creation (for example during online ideation contests). This leads to the following research question for this thesis:

What is the effect of schema (in)consistency on the number and creative quality of ideas generated by consumers in co-creation?

Creativity is important in the development of new products. Customers must therefore be creative in co-creation (Blauth et al., 2014). Vissers & Dankbaar (2002) state that an individuals' level of creativity plays an important role in NPD. An individuals' creativity moderates the relationship between exposure to (in)consistent schemata and the number and creative quality of ideas generated by customers in co-creation. This thesis therefore investigates what the effects of an individuals' creativity are.

1.2 Relevance

The main contribution of this thesis is adding knowledge to the field of co-creation by doing an online experiment on the possible influence of schema (in)consistency on the quality of ideas that are provided by participants. Until now, no research has been conducted about schema (in)consistency in the field of co-creation. This thesis can therefore be a starting point for other research towards schemata in co-creation research. It has not yet been researched if schema theory has an influence on the quality of ideas (moderated by individual creativity) that are provided by customers. Based on the research that is done in this thesis, a contribution is made in linking schema theory to innovation research.

Because NPD is important for companies, it is relevant to know what the best ways are to practice NPD. In this thesis it is investigated if schema (in)consistency is important (controlled for individual creativity) in generating new ideas (which can help companies retain (or gain) their competitive advantages). The conclusion of this research is of value to companies in the sense that they can determine if it is useful to use (in)consistent schemata to reach out to

the creativity of customers. This could for example be valuable for co-creation in online ideation contests.

1.3 Thesis outline

This thesis consists of five chapters. This first chapter was an introduction. chapter 2 will be give an overview of the literature and define the hypotheses. The chapter gives an overview for New Product Development, Customer co-creation and Schema theory. The research method is described in chapter 3. Chapter 4 will present the results of the research. The thesis ends with chapter 5, which is a discussion, including the theoretical implications, the practical implications, limitations of the research and a concluding statement.

2. Literature review

In this chapter the variables that are included in this research are defined, explained further and the relationships are hypothesized. The chapter starts with a literature review about New Product Development, followed by customer co-creation. Then an overview of the literature about Schema theory is given, including the research question of this thesis. The chapter ends with defining the hypotheses about the main effect (relation between exposure to schemata and idea generation for NPD) and the moderating effect (the influences of an individuals' creativity).

2.1 New Product Development

There are several definitions available for New Product Development (NPD). In this thesis NPD is defined following the definition of Krishnan and Ulrich (2001): "the transformation of a market opportunity into a product available for sale". NPD is important for companies to stay ahead of their competition (Hillebrand et al., 2011). Like stated before, NPD can be initiated for two reasons. Firms either use NPD to increase demand, or they want to create a whole new market (Johnson & Kirchain, 2011).

The NPD process is a process of four stages: (1) identification of an opportunity, (2) the development of a product or service, (3) testing that product or service and eventually (4) launch the new product or service (van Kleef et al., 2005). This thesis has the focus on idea generation, meaning that for this research the second stage is of greatest importance.

There are different ways of looking at NPD. A traditional view on NPD, a view that is becoming outdated (Gassmann, 2006), is that all innovations come from sources within a firm. The traditional view is changing; nowadays customers contribute more to NPD (Grönlund et al., 2010). New developed products often fail because they do not meet the requirements of the customers (Cooper, 2013). This is an important reason why the traditional way of doing NPD is changing. More research is done on how to include customers in NPD. This is done mainly because companies understand that deep knowledge of customers is needed to produce successful products (Lagrosen, 2001). Including customers in the NPD process is a form of customer co-creation. Especially in the idea generation stage, customer understanding is very important. Deep customer understanding ensures that ideas with more potential are generated and that products have a higher chance of success (Flint, 2002). Due to the fact that customers are seen as an asset in NPD, this thesis focuses on how companies can benefit most from co-

creation. Because co-creation is a central topic in this thesis, the topic is explained more in-depth in paragraph 2.2.

2.2 Customer Co-creation

As described in the previous paragraph, including customers in NPD is becoming more popular. Customers can be used as a source of competitive advantage and involving them in the value chain is therefore of great importance. Customers can be included in the value chain as resources for ideas, for co-development and as testers of the product or service (Mukhtar et al., 2012).

Customer co-creation (CC) can be defined as "a collaborative new product development activity in which consumers actively contribute and select various elements of a new product offering (Hoyer et al., 2010)". This means that customers are becoming more central in developing new products because they are more involved.

It is important to understand the difference between what can be considered as CC and what cannot. Even with a clear definition it can be hard to understand what is considered to be CC. Prahalad and Ramaswamy (2004) make a distinction between what is CC and what is not. They state that CC goes further than being customer focused, it is about creating value for customer and company. It is not about saying that the customer is king, for companies do not want to please the customer. CC is not about mass customization, but it is about defining problems which customer and company solve together. Customers are not the product managers, but they have an active dialogue and help developing products based on their own experience.

CC has some important benefits. When customers are involved in research, a company can acquire information and desires that can be used to create new product specifications (Kaplan & Haenlein, 2006). When companies get to know the needs of the customer better, and when they include customers in product development, it is more likely that the new developed products will be a success (Von Hippel, 2001). Two main advantages of CC are (1) the rise of efficiency (e.g. costs can be reduced) and (2) an increase of effectiveness (e.g. products fit the customer better, and/or enhancement of product value) (Hoyer et al., 2010).

CC can be part of every stage in NPD. In research by Cooper (2003) it is stated that, especially in the early stages of product development, it is crucial to include CC, for it is more likely to produce successful products if customers are involved in the process. In these stages, CC can be used for idea generation and the development of new product concepts (Gruner &

Homburg, 2000). CC can also be used in commercialization and postlaunch stages, e.g. consumer communities and social media pages can be used to create awareness (Hoyer et al., 2010).

As idea generation is the focus of this thesis, the focus will be on including CC in the early stages of NPD. CC techniques to include customers in (the early stages of) product development provide a limited amount of interaction between a firm and customer (a limited number of customers can be reached, reaching a huge number of customers is expensive) (Hoyer et al., 2010). There are several techniques companies can use to involve customers in co-creation. Well known techniques are the Lead user method and Empathic design. The Lead user method is a method where lead users (people that are far ahead within their industry, innovation wise, and have needs that will expand to the whole marketplace in the near future) are asked to provide new product concepts based on their experience in their field of expertise (von Hippel, 1987; Eisenberg,2011). Empathic design is a technique where researchers observe users in their own environment while using a product. The goal is to find the latent user needs, and to develop better suitable products (Leonard & Rayport, 1997).

Because a limited number of customers can be reached at one time, involving customers in NPD can be expensive. Several things must be taken into consideration that can drive up the cost, for example, it is important that the customers that are identified and recruited are able to help develop a new product, the management of interactions (probability of misunderstanding customers) costs money as well (Mahr et al., 2013). New technologies make it cheaper to include a huge number of customers, mainly because these technologies are linked to the internet and enlarge the company's reach (Sawhney et al., 2005). Overall the cost of CC depends on how complex the knowledge that a company needs is, how hard it is to transfer this knowledge from customer to company and how scarce the number of customers is that have this knowledge (if the customers are scarce they will ask for (larger) compensations) (Mahr et al., 2013).

Recently a term called open innovation emerged. One way of open innovation is an online ideation contest: a form of open innovation in which people from all over the world can provide solutions for problems that organizations have (Yang et al., 2009). Online ideation contests are gaining popularity, both in practice and in academic research (Walter & Back, 2011). One of the main advantages is that online ideation contest can reach a huge amount of people that can solve problems for companies (Yang et al., 2009). Also, other advantages appear; because more people hand in ideas, it is expected that the quality of the best idea is higher, but also when companies receive a higher variability of ideas the quality of the best idea

increases (King & Lakhani, 2013). Hossain (2012) states that other advantages of online ideation can also be lower costs to exchange information (for example because people can hand in ideas online instead of having to go to an office) and quick solutions for problems. Yet, in his research he also states that there are disadvantages, e.g. bad ideas need to be checked as well, which takes time.

As mentioned in paragraph 2.1, involving customers in NPD is becoming more popular. Different researchers also conclude that including customers in the NPD process produces a higher chance of developing successful products (von Hippel, 2001; Cooper, 2003; Fuchs & Schreier, 2010). Based on these researches it can be stated that CC has a positive influence on idea generation in NPD. Online ideation contests are increasing in popularity and are becoming an important resource in including customers in idea generation. How can we optimally make use of ideation contests to generate new ideas in NPD?

2.3 Cognitive schema theory

As described in the last paragraph, online ideation contests are gaining popularity in both academic and practical research (Walter & Back, 2011). The goal of ideation contests is to reach out to high quality problem solvers and to get diversified solutions of high quality, that are also provided with the problem solvers' incentives and strategic actions (Yang et al., 2010). A challenge that needs to be faced is that people do not know what they want until it is showed to them (Jobs, 1998). Customers are not able to think about new product ideas, use of new technologies and use of different materials than the materials that have been used so far (Ulwick, 2002). Because customers need to think of new product ideas in co-creation, creative thinking is an important factor in NPD (Bissola et al., 2013). Snyder et al. (2004) found proof that subconscious idea generation is more creative than conscious idea generation; in their research, participants needed to think of as many new ways to use a piece of paper. After the first session the participants ran out of ideas. Yet, after a distraction (and instructions that they did not need to think of the task anymore), they thought of new ideas in a second session. Based on the research of Snyder et al. (2004) it can be stated that ideation contests can be more beneficial if the subconscious thoughts are addressed.

One subconscious process is that people think in schemata (Woody & Phillips, 1995). Therefore, a factor that can be of influence to optimally make use of ideation contests in NPD is the use of exposure to different cognitive schemata. According to a research of Wagoner (2013), a schema can be broadly defined as "a knowledge structure in the head that is used in the storage of information". New schemata can be built, or existing schemata can be updated

when new information comes available to them due to an instructional experience (Derry, 1996). Schemata are the building blocks of cognition, all information processes (e.g. retrieving information from the memory, the organization of actions, and the interpretation of sensory data) depend on schemata (Rumelhart, 2017, p. 33). All knowledge about concepts an individual has is represented in schemata. These concepts can be objects, situations, events, sequences of events, actions and sequences of actions (Rumelhart, 2017, p. 34). Examples could be a ball, which is part of the schema football, or a piece of fruit that is placed in the schema about food.

In a research by Zhiqing (2015) it is stated that changes in schemata can happen in two different ways. The first way that is described is assimilation, this happens when an individual adds a perceived stimulus to an already existing schema. This makes sure that a schema stays up to date. An example of assimilation is that an individual finds out about a new sort of soft drink, which is then added to the schema soft drinks. The second way, which is called accommodation, takes place when an individual can build a new schema or adjust an old one to accept and accommodate a stimulus when it does not fit in an existing schema. An example of accommodation could be a student that learns about a new topic in class. As a result, a schema is created for that topic, or a schema is adjusted to make sure this topic can fit in an existing schema. According to Zhiqing (2015), both assimilation and accommodation are highly correlated. Accommodation and assimilation always happen in a mix. When knowledge is gathered and assimilation changes the schema, the schema is also partially accommodated, and vice versa (for example, a schema can be extended by discovering a new stimulus, but also an adjustment must be made to the schema).

Next to assimilation and accommodation, Taylor and Noseworthy (2019) found proof that there is a third way in which one can be deal with new information. This way is called fluid compensation. Fluid compensation is articulated first by Heine et al. (2006). It takes place when a stimulus cannot find a place in an existing schema of an individual. The individual then adheres to other relational schemata (even if those schemata are unrelated to the expected relationship that is in question). In short, it means that a schema inconsistency can be overcome by support of another schema, which is so called compensating (Taylor & Noseworthy, 2019).

In some researches it is concluded that schema inconsistency has some cognitive disadvantages. Mendes et al. (2007) found that inconsistent schemata are related to cardiovascular responses that are comparable to when someone perceives a threat. They also found a poorer cognitive performance and more negative and defeat-related behavior. It is also implied by Porath and Erez (2009) that schema inconsistency has a negative influence on

creativity. They state that inconsistency in schemata can lead to spending cognitive resources on evaluating the situation, spending time to make sense of the stimulus, making moral judgements and processing how to respond to the stimulus.

More often, researchers found positive influences as a result of exposure to inconsistent schemata. An example of this is that peoples' memory is better when it comes to schema inconsistent items than when they are considering schema consistent items (Neuschatz et al., 2002). Also, exposure to inconsistent schemata has a positive influence on finding new solutions to problems, as explained by Gocłowska et al. (2012). Here they tested if thinking about counter-stereotypes (e.g. strong woman, black president) enhanced cognitive flexibility and creative thinking and they found support that it did. Also, in research by Miron-Spektor et al. (2011) it is stated that the use of paradoxical frames leads to a more creative mindset. They suggest that the influence of paradoxical frames on creativity is due to the fact that the frames create a conflict in individuals, which improves their ability to integrate contradictions. This again leads to an increase in people's creative ability. Research of Ritter et al. (2012) and Wan and Chiu (2002) also linked exposure to schema inconsistency to enhancement of idea creativity.

Other research concludes that exposure to inconsistent schemata had positive influence on the creative thinking of individuals (Gocłowska et al., 2012; Miron-Spektor et al., 2011; Ritter et al, 2012; Wan & Chiu, 2002). Also, the quality of ideas generated by customers in co-creation could get better after exposure to inconsistent schemata. This leads to the following research question for this thesis:

What is the effect of schema (in)consistency on the number and creative quality of ideas generated by consumers in co-creation?

2.4 Hypotheses

In this paragraph the hypotheses are defined. The hypotheses are based on the literature found. Firstly, hypotheses about the exposure to inconsistent schemata are defined, then a hypothesis about the influence of an individuals' creativity is defined.

2.4.1 Exposure to schemata

Like described in the paragraph above, idea creativity is enhanced when people are exposed to inconsistent schemata. As creativity is very important in NPD (Bissola et al., 2013) and exposure to inconsistent schemata enhances creativity, it is expected that exposing consumers

to inconsistent schemata raises the number and idea quality of ideas they generate in NPD. In the literature on (in)consistent schemata it is also found that exposure to inconsistent schemata has a more positive effect on one's creativity than exposure to consistent schemata (Gocłowska et al., 2012; Miron-Spektor et al., 2011; Ritter et al., 2012; Wan & Chiu, 2002). Therefore, it is expected that exposure to inconsistent schemata has a more positive influence on ideas generated in NPD than exposure to consistent schemata, or no exposure to schemata. This leads to the following hypotheses:

H1: Exposure to inconsistent schemata leads to a higher number of ideas than exposure to consistent schemata, or no exposure to schemata.

H2: Exposure to inconsistent schemata leads to higher creative idea quality than exposure to consistent, or no exposure to schemata.

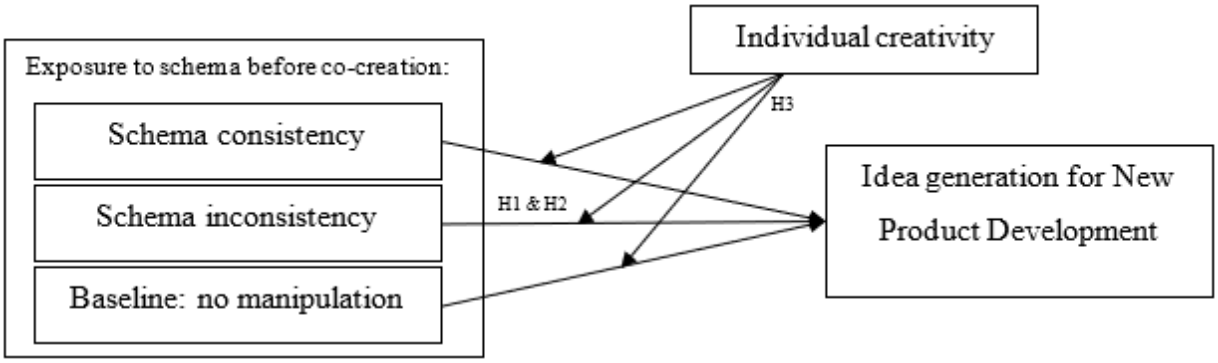
2.4.2 Individual Creativity

An individuals' creativity level is of influence on the relationship between exposure to schema (in)consistency and idea generation in NPD. It is therefore the moderator that is included in this research. The success of new developed products depends on the creativity of the ideas (Scanlon & Jana, 2007). Creativity is defined as "the development of a new product, an idea, or a problem solution that is of value" (Hennessey & Amabile, 2010). Creativity is an important factor within NPD; in order to invent new products or services, employees and customers need to be creative (Blauth et al., 2014). In the ideation phase, individual creativity plays an especially important role (Vissers & Dankbaar, 2002). Because creativity is of influence on NPD, it also influences this research, which leads to the following hypothesis:

H3: The relationship between exposure to schema (in)consistency and idea generation in New Product Development is moderated by an individuals' creativity.

2.5 Conceptual model

Based on the previous paragraphs the following conceptual model is created:



3. Research method

This chapter contains the research method. For this thesis, an experiment is conducted. The experiment is administered online via Qualtrics. Besides the research design, information is given about the procedure, the participants, which material and measures are used and lastly the research ethics.

3.1 Research design

This thesis is based on an experiment, for it is believed that this way of research is the most appropriate way to see if (in)consistent schemata can influence the quantity and creative quality of ideas generated by customers. For this thesis, an online experiment was conducted. Online experiments are becoming more popular, especially compared to traditional lab experiments (Dandurand et al., 2008). Online experiments have advantages and disadvantages. Some advantages are that online experiments are automated, which reduces the time spent managing the experiment (Reips, 2002). Online experiments are also not bounded to a lab environment (Reips, 2000) and participants can do the experiment 24 hours a day (Reips, 2002), which increases their comfort (Salgado & Moscoso, 2003). There are also some disadvantages, e.g. the environment can be more variable with noise or light (this can lead to different results) (Dandurand et al., 2008), online experiments are vulnerable to multiple submissions, for it cannot be checked how often someone participates (Reips, 2000).

An online experiment has multiple benefits in the gathering of data. It is easier to reach larger groups of people and there is no appointment needed to participate in the experiment. With an online experiment much time can be saved. The outbreak of the Covid-19 virus also contributed in choosing for an online experiment, as it was no longer possible to organize a laboratory experiment.

For this thesis, the independent variable is the exposure to (in)consistent schemata. The experiment has three conditions representing the independent variable. These three conditions are the following: a condition with exposure to consistent pictures, a condition with exposure to inconsistent pictures and a condition without exposure to pictures (the baseline condition). To test the differences between the conditions a between-subject design is used.

In this experiment the dependent variable is the number and creative quality of ideas in New Product Development (NPD). In this thesis the dependent variable has three levels, (1) the number of ideas generated, (2) the creative quality of the ideas and (3) flexibility in thinking while generating ideas. To be able to measure those levels, participants needed to complete two

tasks (task 1: thinking of new pasta names for the pasta brand ClassyPasta and task 2: thinking of new ways of using pastas)

In this research one moderating variable was included, individuals' creativity. It was expected that this variable partially explained the results of the experiment (as some participants were more creative because they would have thought about more ideas if there was no exposure to schemata). An individuals' creativity is measured by the Creative Achievement Questionnaire (Carson et al., 2005).

3.2 Procedure

To do the experiment, online survey tool Qualtrics is used. Before starting the experiment, participants needed to agree with a form about confidentiality and anonymity (explained in paragraph 3.5) and they needed to declare that their English was of a sufficient level.

At first participants got to know the task for the first experiment "provide as many new pasta names as possible" for pasta brand ClassyPasta. This was followed by an exact explanation of how participants were able to share their ideas. Participants were told that when they had ideas, they could be typed into one of the boxes of the form that was presented to them.

Starting from that moment, participants were randomly assigned to one of the three conditions (the conditions with consistent schemata, inconsistent schemata or the baseline condition (no schemata)). Participants needed to participate in two tasks. The first one was to think of as many new names as possible for the new pasta for which they were given one minute. In the schema consistent condition, four schema consistent pictures were displayed on a screen during this 1-minute period; in the inconsistent condition, four schema inconsistent pictures were displayed on the screen during this 1-minute period; in the baseline condition there were no pictures displayed on the screen during this 1-minute period. When the minute was over, participants were directed to a new screen and got one more minute to type in their ideas while the pictures (in case of the consistent and inconsistent schemata) were still presented on top of the screen.

In the second task, participants had to think of new ways to use pasta. They all saw an example in which pasta was used to make art. Again, in the schema consistent condition, four schema consistent pictures were displayed on the screen during this 1-minute period; in the inconsistent condition, four schema inconsistent pictures were displayed on the screen during this 1-minute period; in the baseline condition there were no pictures displayed on the screen during this 1-minute period. After this, participants got one minute to type in all their ideas

while the pictures (in case of the consistent and inconsistent schemata) were still presented on screen.

When the experiment was completed, the participants needed to fill in a questionnaire about individual creativity. Participants had to fill in questions about their creative achievements. They were able to click on the box in front of the sentences that were most applicable to them. After the questionnaire, the participants needed to fill in some demographic data. After this the experiment was fully completed.

3.3 Participants

In this thesis 217 participants participated in the experiment. The participants were approached by the researcher and colleague students. There was no selection procedure. Everyone could have participated in this experiment; no special knowledge was needed beforehand. The survey was advertised by approaching the network of the researcher (and colleague students) via WhatsApp, Facebook and LinkedIn. Participants participated voluntarily and no incentives were given.

196 participants completed the whole survey, 21 participants did not complete the whole survey (20 of them did not speak English, 1 did not agree to the terms at the start of the survey) and were not included in the analysis.

As explained, the participants were split over three conditions. They were randomly assigned to one of the three conditions. 65 participants were exposed to consistent schemata, 65 participants were exposed to inconsistent schemata, and 66 participants were not exposed to schemata (the baseline condition).

In this thesis 75 males (38%), 116 females (59%), and one other (1%) individual participated. Four participants (2%) did not want to share their gender.

One hundred and thirty participants were between 21 and 30 years old, which was 66% of the sample. Thirty-two participants were of an age under 21 (16%), 15 between 31 and 40 (8%), 6 between 41 and 50 (3%) and 13 were between 51 and 65 years old (7%).

Most participants were highly educated with 80 participants finishing their bachelor's degree (41%), 38 their master's degree (19%) and 2 their Doctoral degree (1%). Thirteen participants finished their Associate degree (7%), 53 their Highschool degree or an equivalent of Highschool (27%), 10 had an educational level less than a Highschool degree (5%).

Participants had different nationalities. The largest amount (88) of participants was from the Netherlands (45%). Other largely represented nationalities were Greek, 50 participants (26%) and Turkish, 27 participants (14%). Thirty-one participants had other nationalities,

responsible for 16% of the participants. Represented nationalities were among others German, French, Italian, American, Brazilian, Indian and Columbian.

3.4 Materials

In this paragraph the materials used for this research are explained. The paragraph is split up in measurements and stimuli used in task 1 of the experiment, measures and stimuli used in task 2 and measures for individual creativity.

3.4.1 Stimuli task 1

In the first task two different stimuli were used. The first stimulus used is validated in a research of Gocłowska et al. (2014). In this research they used a set of consistent and inconsistent pictures. Eight pictures were used in total during the first task (four schema consistent pictures and four schema inconsistent pictures). As has been described in paragraph 3.1, the experiment had three conditions. In the schema consistent condition, pictures were presented that were consistent with the schemata of participants (camel standing in a desert, penguin standing on an ice sheet, boat in the sea, and a car on land). In the schema inconsistent condition, pictures were presented that were inconsistent with the schemata of participants (camel standing on an ice sheet, penguin standing in a desert, boat on land, and car in the sea). In the baseline condition participants were not exposed to any pictures.

During the first task, a second stimulus was used. Participants were shown five names that ClassyPasta already thought of themselves: Lunghi, Tubuli, Cerchi, Piazzi, and Retani. Names that end with the letter 'i' and have a length of five letters. This stimulus is based on a research of Dijksterhuis and Meurs (2006). The exposure to those names made it possible to see if participants in different conditions had more deviating thoughts (and were therefore able to provide names with higher creative quality).

3.4.2 Stimuli task 2

In the second task pictures of the research of Gocłowska et al. (2014) were used as well. In this task, eight pictures were used as well (four schema consistent pictures and four schema inconsistent pictures). These pictures were different from the pictures in the first task. As was described before, the experiment had three conditions. In the schema consistent condition pictures were presented that were consistent with the schemata of participants (a Bedouin in a desert, an Eskimo on an ice sheet, a football player on a football field and a pastor in front of a church). In the schema inconsistent condition, pictures were presented that were inconsistent

with the schemata of participants (a Bedouin on an ice sheet, an Eskimo in a desert, a football player on an ice hockey field, and a pastor in front of a mosque). In the baseline condition participants were not exposed to any pictures.

3.4.3 Measurements task 1

In this research it was tested if exposure to schema (in)consistency influences the number and creative quality of ideas generated in NPD. As was stated in paragraph 3.1, there are three measures of interest in this thesis, (1) the number of ideas generated, (2) the creative quality of the ideas and (3) flexibility in thinking while generating ideas. To measure the dependent variable, both tasks were measured in a different way. In the first task, the total number of ideas per participant (meaning the total number of pasta names a participant generated for ClassyPasta) was counted. The second way to measure the dependent variable was by assessing the quality of ideas. This was done by counting the times a pasta name deviated (the pasta name ended with a different letter then 'i') from the examples given by ClassyPasta.

3.4.4 Measurements task 2

In the second task, the total number of ideas per participant was also counted. A second measure was flexibility. All generated ideas were sorted into categories to see how flexible a participant thought. Two objective raters sorted the ideas into categories (for the category list, see appendix I). The inter-rater reliability for rating the flexibility of ideas was excellent (α=0.94). The third measure was the creativity of an idea. The ideas were rated to measure the creativity, which was done again by the two raters. In order to rate an idea as creative, the idea should be useful and novel (Hennessey & Amabile, 2010). To measure the creativity of an idea, a five-point scale was used (1= 'not at all creative', to 5 'extremely creative'). Each idea got a mean score based on the ratings of the two raters. For the creativity score the inter-rater reliability was good (α= 0.76). The mean scores provided by the raters were divided by the total number of ideas a participant gave. This was done to make sure that each score was independent from the number of ideas that were generated (fluency). This mean score per participant was used to test the differences between groups.

3.4.5 Measurements individual creativity

The individual creativity of participants was measured with the Creative Achievement Questionnaire (Carson et al., 2005). The Creative Achievement Questionnaire is a self-report measure of creative achievement that assesses achievement across ten categories of creativity

(Carson et al., 2005). The ten domains were visual arts, music, dance, architectural design, creative writing, humor, inventions, scientific discovery, theater and film and culinary arts. Every category has seven items that are rank-ordered with ascending weights from 0 to 7 points. In each category the participant needed to place a check mark beside the sentence(s) that applied to him or her (for the whole questionnaire, see appendix II). The creativity score was then calculated as follows: every item had its own score (see the score in front of the sentence in appendix II) and some items have an asterisk in front. When an item has an asterisk, the scores were multiplied with the times this item was achieved. All scores within the category were summed up. All total scores of the categories were then summed up to attain a total score for the Creative Achievement Questionnaire (the higher the score is, the more creative a participant is; Carson et al., 2005).

3.4.6 Analysis

To analyze the differences between the three conditions there was made use of a one-way MANCOVA. During the experiment, multiple dependent variables were measured. With a one-way MANCOVA, values of all dependent variables are considered together under control of the covariate (individual creativity). Afterwards, comparisons could be made between the conditions (Laerd Statistics, n.d.). It was believed that there were correlations between the dependent variables, considering all the variables together gave more power to detect differences (Laerd Statistics, n.d).

When the assumptions of a one-way MANCOVA were not met, the dependent variables were separately tested with a one-way ANCOVA. With a one-way ANCOVA comparisons between groups could be made as well. As was stated above, analyzing with a one-way ANCOVA gives less chance to find differences between groups. Because a one-way ANCOVA does not, like a one-way MANCOVA, optimally combine the multiple dependent measures into a single value, maximizing the differences across groups (Hair et al., 2013, p. 670).

3.5 Research ethics

Participant of this research volunteered to participate. At the beginning of the experiment participants needed to sign a form. In this form a declaration was added where they said that participation was voluntarily. They needed to declare that it was possible for them to not participate in the experiment as well. Participants did not receive an incentive before starting the experiment. They wanted to help the researcher finish his thesis research voluntarily. No money or goods were offered to persuade participants to start the experiment.

Before starting the experiment, participants were not informed about the research purpose. Giving them this information could have biased the results, as the participants probably had a different focus towards the pictures presented in the research. After completing the experiment, participants had the option to email the researcher if they wanted to know the research purpose. None of the participants inquired about the research purpose.

In the same form where participants declared they volunteered to participate, they also declared that they agreed to the terms of this research and trusted the researcher with the information they provided. Participants were informed before the experiment that all information provided by participants was anonymous and confidential. All information is only used for the purposes of this research. Before the experiment, participants were also informed about the length of the experiment, which was approximately 10 minutes.

It was optional for participants to stop participating during the entire experiment. In the beginning the participants were asked to fully complete the experiment, but they were never obligated to finish. Participants got detailed descriptions of the tasks they were asked to complete. Factors that may have influenced their willingness to participate were explained to them. The tasks of the experiment were explained in detail. When a participant did not want to participate in the experiment anymore, he or she was free to quit. For this research no minors were approached. All participants were able to make their own decisions (if they wanted to continue or leave the experiment) if they felt unsure about their willingness to fulfil certain tasks.

Data from the experiment were stored in a protected area, with no access for others. Because the experiment was part of three theses, some data were involved in mail contact. The mail connection was a secured connection, which prevented any potential data leaks.

4. Results

In this chapter the results of the experiment are presented. The chapter starts with the results of the first task, followed by a summary of the results of that task. Secondly, the results of the second task are presented, also followed by a short summary.

4.1 Task 1, new pasta names

In the first task, as explained in paragraph 3.2, participants needed to generate as many new pasta names as possible. To measure the effects of exposure to (in)consistent schema on Idea generation in New Product Development (NPD), the first task tested two indicators. Those indicators were the number of ideas produced by a participant and the number of deviated ideas from the examples provided.

4.1.1 Number of ideas generated and Number of ideas deviating from example

To test the effect of exposure to consistent, inconsistent and no schemata, a one-way MANCOVA was run to determine the effects on the number of ideas (new pasta names) and number of deviating ideas (number of ideas deviating from the example given).

First, the assumptions of MANCOVA were tested. There was a linear relationship between the covariate, individual creativity, and each of the dependent variables – number of ideas and number of ideas deviating from the example – for each condition, as assessed by visual inspection of a scatterplot. There was Homogeneity of regression slopes, as assessed by the interaction term (individual creativity*condition), $F(4,378) = 1.85$, $p = 0.119$. Also, the assumption homogeneity of variances and covariances was met, assessed by Box's M test, $p = 0.393$, which is higher than $p > 0.001$. There were two univariate outliers in the data, which were assessed by standardized residuals greater than three standard deviations. One multivariate outlier was found, assessed by Mahalanobis distance, ($p > 0.001$). All outliers were included in the test, as it was tested if they had no effect on the results (a MANCOVA was run without the outliers). The Residuals were not normally distributed, as assessed by Shapiro-Wilk's test ($p < 0.05$). Transforming variables had no effect, it was chosen to carry on regardless the fact that the assumption of normality was not met. One-way MANCOVAs are robust to deviations in normality. The sample sizes (number of participants per condition) in this thesis were equal, which means that non-normality does not affect the Type I error (probability of rejecting the null hypothesis when it should be accepted) rate substantially (Glass et al., 1972; Mardia 1971).

Table 1

Means, Adjusted Means, Standard Deviations and Standard Errors for the Two Creative Quality Measures for Each Exposure Condition

	Measurement creative quality			
	Number of ideas		Number of deviating ideas	
Group	M (SD)	M_{adj} (SE)	M (SD)	M_{adj} (SE)
Baseline	3.5 (2.1)	3.5 (0.2)	1.5 (1.5)	1.5 (0.2)
Consistent	3.6 (1.9)	3.7 (0.2)	1.5 (1.8)	1.5 (0.2)
Inconsistent	3.6 (1.9)	3.6 (0.2)	1.5 (1.4)	1.5 (0.2)

Note: Number of ideas is measured as total number of ideas; Number of deviating ideas is measured as total number of ideas deviating from the given example.

The results of the one-way MANCOVA are presented in *table 1*. The unadjusted means are the means without control of the covariate (individual creativity), the adjusted means are the means under control of the covariate. The one-way MANCOVA showed that there was no statistically significant difference between the exposure to consistent schemata, exposure to inconsistent schemata and baseline conditions on the dependent variables after controlling for individual creativity, $F(4,382) = 0.11$, $p = .979$, *Wilks' Λ* = 1.00, *partial η2* = .001.

A one-way MANOVA showed that also without the control of individual creativity there were no statistical differences between the three conditions on the combined dependent variables $F(4,384) = 0.09$, $p = 0.985$, *Wilks' Λ* = 1.00, *partial η2* = .001.

Results task 1 after removing non participating participants

Some participants did not fill in any names, which could indicate that they did not fully understand the task they were given or were not participating seriously. Those participants were deleted from the dataset to test if any significant effects could be found. Nine participants were deleted in total. Before executing the one-way MANCOVA the assumptions were tested again. Removing these nine participants had as a consequence that the assumption of homogeneity of regression slopes was not met, $F(4,360) = 2.65$, $p = 0.033$. Both indicators (number of ideas generated and number of deviating ideas) were tested separately with a one-way ANCOVA.

First, the assumptions of a one-way ANVCOVA were tested, but because no homogeneity of regression slopes was found, $F(2,181) = 4.90$, $p = 0.008$, a one-way ANOVA was run. In the data four outliers were found, as assessed by inspection of a boxplot. Those outliers were included in the one-way ANOVA because running a one-way ANOVA without

those outliers did not generate different results. Standardized residuals for the interventions were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). Transforming the variable had no effect, so it was chosen to carry on regardless the fact that the assumption was not met. A one-way ANOVA is robust to deviations in normality. The sample sizes (number of participants per condition) in this thesis were equal, which means that non-normality does not affect Type I error (probability of rejecting the null hypothesis when it should be accepted) rate substantially (Leard Statistics, n.d.). There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .578$). The one-way ANOVA showed no differences between the conditions, $F(2,184) = 0.07$, $p = 0.930$, *partial η2* = 0.001.

Also, before doing a one-way ANCOVA for the number of ideas deviating from the sample, the assumptions needed to be tested. A linear relationship was found between the number of ideas and an individuals' creativity by visual inspection of a scatterplot. Homogeneity of regression slope was found, the interaction term (condition*individual creativity) was not statistically significant, $F(2,181) = 1.77$, $p = 0.173$. Standardized residuals for the interventions were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). Transforming the variable had no effect It was therefore chosen to carry on regardless of the fact that the assumption was not met. A one-way ANCOVA is robust to deviations in normality. The sample sizes (number of participants per condition) in this thesis were equal, which means that non-normality does not affect Type I error (probability of rejecting the null hypothesis when it should be accepted) rate substantially (Leard Statistics, n.d.). There was homoscedasticity as well as homogeneity of variances. This was assessed by a visual inspection of a scatterplot and Levene's test of homogeneity of variance ($p = 0.132$). In the data two outliers were found (standardized residual greater than ±3 standard deviations). It was tested that these outliers had no effect on the results (an ANCOVA was run without the outliers, which gave no different results) and were included in the test.

Table 2

Adjusted and Unadjusted Intervention Means and Variability for Number of Ideas with Individual Creativity as Covariate (after deleting non participating participants)

		Unadjusted		*Adjusted*	
	N	M	SD	M	SE
Baseline	62	1.6	1.5	1.6	0.2
Consistent	62	1.5	1.8	1.6	0.2
Inconsistent	63	1.5	1.4	1.5	0.2

Note: N=number of participants, M=Mean, SD=Standard Deviation, SE=Standard Error, Consistent=exposure to consistent schemata, Inconsistent= exposure to inconsistent schemata. Number of ideas is measured as total number of ideas.

The results of the one-way ANCOVA are presented in *table 2*. The unadjusted means are the means without control of the covariate (individual creativity). The adjusted means are the means under control of the covariate. After adjustment for individual creativity, there was no statistically significant difference in the differences per conditions (exposure to consistent, inconsistent or no schemata), $F(2,183) = 0.097$, $p = 0.908$, *partial η2* = 0.001.

The covariate was not significant, $F(1,183) = 3.62$, $p = 0.059$, *partial η2* = 0.019. Therefore, a one-way ANOVA was run to test the effects of the conditions without the control of individual creativity. Again, there were no differences per condition, $F(2,184) = 0.11$, $p = 0.899$, *partial η2* = 0.001.

4.1.2 Summary results task 1

No proof is found that there are different influences from the exposure to consistent, exposure to inconsistent and baseline condition. Both the number of pasta names generated and the number of deviating names from the example were not affected by exposure to different schemata. Not even after the deletion of participants that did not fill in any names. There was no proof found that individual creativity had a moderating effect, thus the covariate was not significant.

4.2 Task 2, new ways to use pasta

As was described in paragraph 3.2, participants needed to think of new ideas of using pasta in the second task. To measure the effects of exposure to (in)consistent schema on idea generation in NPD, this task tested three indicators. These indicators are the number of ideas generated, flexibility in generating ideas (the number of categories a participant's ideas can be assigned to)

and the creative quality of the generated ideas. The indicators were supposed to be tested with a one-way MANCOVA, but the assumptions of linearity and homogeneity of variances and covariances were violated. Homogeneity of variances and covariances is a critical assumption, because this one was not met, a one-way MANCOVA was no option. The indicators were tested separately with one-way ANCOVAs.

4.2.1 Number of ideas

As was explained above, a one-way ANCOVA was run to see what the effects of exposure to consistent, inconsistent and no schemata were on the number of ideas generated. This was under control of an individuals' creativity.

First the assumptions of ANVCOVA were tested. A linear relationship was found between number of ideas and an individuals' creativity by visual inspection of a scatterplot. Homogeneity of regression slope was found, the interaction term (condition*individual creativity) was not statistically significant, $F(2,190) = 2.01$, $p = 0.137$. Standardized residuals for the interventions were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). Transforming the variable had no effect. It was therefore chosen to carry on regardless of the fact that the assumption was not met. A one-way ANCOVA is robust to deviations in normality. The sample sizes (number of participants per condition) in this thesis were equal, which means that non-normality does not affect Type I error (probability of rejecting the null hypothesis when it should be accepted) rate substantially (Leard Statistics, n.d.). There was homoscedasticity and homogeneity of variances, which was assessed by a visual inspection of a scatterplot and Levene's test of homogeneity of variance ($p = 0.609$). In the data one outlier was found (standardized residual greater than ±3 standard deviations). It was tested that this outlier had no effect on the results (an ANCOVA was run without the outliers, which gave no different results) and was included in the test.

Table 3

Adjusted and Unadjusted Intervention Means and Variability for Number of Ideas with Individual Creativity as Covariate

		Unadjusted		*Adjusted*	
	N	M	SD	M	SE
Baseline	66	3.0	1.7	3.0	0.2
Consistent	65	3.7	1.9	3.8	0.2
Inconsistent	65	3.3	1.8	3.3	0.2

Note: N=number of participants, M=Mean, SD=Standard Deviation, SE=Standard Error, Consistent=exposure to consistent schemata, Inconsistent= exposure to inconsistent schemata. Number of ideas is measured as total number of ideas.

The results of the one-way ANCOVA are presented in *table 3*. The unadjusted means are the means without control of the covariate (individual creativity). The adjusted means are the means under control of the covariate. After adjustment for individual creativity, there was no statistically significant difference in the differences per conditions (exposure to consistent, inconsistent or no schemata), $F(2,192) = 2.87$, $p = 0.059$, *partial η2* = 0.029.

The covariate was not significant, $F(1,192) = 1.71$, $p = 0.193$, *partial η2* = 0.009. Therefore, a one-way ANOVA was run to test the effects of the conditions without the control of individual creativity. Again, there were no differences per condition, $F(2,193) = 2.59$, $p = 0.078$, *partial η2*=0.026.

Number of ideas after deleting food categories

Some participants filled in food related answers, while it was instructed not to give such answers. This could indicate that they did not fully understand the task that they were given or that they were not participating seriously. Ideas that the raters agreed upon that were ideas within the category "Food combination" or "Food related usage" were deleted from the dataset. Deleting the answers changed the dataset and because of this the assumptions of the one-way ANCOVA were tested again. A linear relationship was found between number of ideas and an individuals' creativity by visual inspection of a scatterplot. Homogeneity of regression slope was found and the interaction term (condition*individual creativity) was not statistically significant, $F(2,190) = 2.63$, p=0.074. Standardized residuals for the interventions were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). Transforming the variable had no effect. It was therefore chosen to carry on regardless of the fact that the assumption was not met. A one-way ANCOVA is robust to deviations in normality. The sample sizes (number

of participants per condition) in this thesis were equal, which means that non-normality does not affect Type I error (probability of rejecting the null hypothesis when it should be accepted) rate substantially (Leard Statistics, n.d.). There was homoscedasticity and homogeneity of variances. This was assessed by a visual inspection of a scatterplot and Levene's test of homogeneity of variance (p = 0.620). one outlier was found in the data (standardized residual greater than ±3 standard deviations). It was tested that this outlier had no effect on the results (an ANCOVA was run without the outliers, which gave no different results) and was thus included in the test.

Table 4

Adjusted and Unadjusted Intervention Means and Variability for Number of Ideas with Individual Creativity as Covariate (after deleting food categories)

		Unadjusted		*Adjusted*	
	N	M	SD	M	SE
Baseline	66	2.9	1.7	2.9	0.2
Consistent	65	3.3	1.9	3.3	0.2
Inconsistent	65	3.0	1.6	3.0	0.2

Note: N=number of participants, M=Mean, SD=Standard Deviation, SE=Standard Error, Consistent=exposure to consistent schemata, Inconsistent= exposure to inconsistent schemata. Number of ideas is measured as total number of ideas.

The results of the one-way ANCOVA are presented in *table 4*. The unadjusted means are the means without control of the covariate (individual creativity). The adjusted means are the means under control of the covariate. After adjustment for individual creativity, there was no statistically significant difference in the differences per conditions (exposure to consistent, inconsistent or no schemata), $F(2,192) = 1.20$, $p = 0.305$, *partial η2* = 0.012.

The covariate was not significant, $F(1,192) = 1.32$, $p = 0.251$, *partial η2* = 0.007. Therefore, a one-way ANOVA was run to test the effects of the conditions without the control of individual creativity. Again, there were no differences per condition, $F(2,193) = 1.04$, $p = 0.355$, *partial η2*=0.011.

4.2.2 Flexibility

To test the differences between groups (exposure to consistent, inconsistent or no schemata) regarding flexibility, a one-way ANCOVA was run as well. This was under control of an individuals' creativity.

First the assumptions of a one-way ANCOVA were tested. There was a linear relationship found between flexibility and an individuals' creativity by visual inspection of a scatterplot. Homogeneity of regression slope was found and the interaction term (condition*individual creativity) was not statistically significant, $F(2,190) = 1.80$, $p = 0.168$. Standardized residuals for the interventions were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). Transforming the variable had no effect. It was thus chosen to carry on regardless of the fact that the assumption was not met. A one-way ANCOVA is robust to deviations in normality. The sample sizes (number of participants per condition) in this thesis were equal, which means that non-normality does not affect Type I error (probability of rejecting the null hypothesis when it should be accepted) rate substantially (Leard Statistics, n.d.).

There was homoscedasticity and homogeneity of variances, which was assessed by a visual inspection of a scatterplot and Levene's test of homogeneity of variance ($p = 0.378$). One outlier was found in the data. It was tested that this outlier had no effect on the results (a one-way ANCOVA was run without the outliers, which gave no different results) and it was thus included in the test.

Table 5

Adjusted and Unadjusted Intervention Means and Variability for Flexibility with Individual Creativity as Covariate

		Unadjusted		*Adjusted*	
	N	M	SD	M	SE
Baseline	66	2.5	1.4	2.5	0.2
Consistent	65	2.9	1.2	2.9	0.2
Inconsistent	65	2.9	1.4	2.9	0.2

Note: N=number of participants, M=Mean, SD=Standard Deviation, SE=Standard Error, Consistent=exposure to consistent schemata, Inconsistent= exposure to inconsistent schemata. Flexibility is measured as total categories a participant gave answers for.

The results of the one-way ANCOVA are presented in *table 5*. The unadjusted means are the means without control of the covariate (individual creativity). The adjusted means are the means under control of the covariate. After adjustment for individual creativity, there was no statistically significant difference in the differences per conditions (exposure to consistent, inconsistent or no schemata), $F(2,192) = 1.57$, $p = 0.212$, *partial* $\eta 2 = 0.016$.

The covariate was not significant, $F(1,192) = 2.39$, $p = 0.124$, *partial η2* = 0.012. Therefore, a one-way ANOVA was run to test the effects of the conditions without the control of individual creativity. Again, there were no differences per condition, $F(2,193) = 1.40$, $p = 0.250$, *partial η2* = 0.014.

Flexibility after deleting food categories

Because of the deletion of the answers within the category "Food combination" and "Food related usage" the assumptions of the one-way ANCOVA about flexibility needed to be tested again. A linear relationship was found between flexibility and an individuals' creativity by visual inspection of a scatterplot. Homogeneity of regression slope was found and the interaction term (condition*individual creativity) was not statistically significant, $F(2,190) = 2.66$, $p = 0.073$. Standardized residuals for the interventions were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). Transforming the variable had no effect and it was therefore chosen to carry on regardless of the fact that the assumption was not met. A one-way ANCOVA is robust to deviations in normality. The sample sizes (number of participants per condition) in this thesis were equal, which means that non-normality does not affect Type I error (probability of rejecting the null hypothesis when it should be accepted) rate substantially (Leard Statistics, n.d.). There was homoscedasticity and homogeneity of variances. This was assessed by a visual inspection of a scatterplot and Levene's test of homogeneity of variance ($p = 0.487$). No outliers were found in the data (standardized residual greater than ±3 standard deviations).

Table 6

Adjusted and Unadjusted Intervention Means and Variability for Flexibility with Individual Creativity as Covariate (after deleting food categories)

		Unadjusted		*Adjusted*	
	N	M	SD	M	SE
Baseline	66	2.4	1.3	2.4	0.2
Consistent	65	2.6	1.2	2.6	0.2
Inconsistent	65	2.6	1.3	2.7	0.2

Note: N=number of participants, M=Mean, SD=Standard Deviation, SE=Standard Error, Consistent=exposure to consistent schemata, Inconsistent= exposure to inconsistent schemata. Number of ideas is measured as total number of ideas.

The results of the one-way ANCOVA are presented in *table 6*. The unadjusted means are the means without control of the covariate (individual creativity). The adjusted means are the means under control of the covariate. After adjustment for individual creativity, there was no statistically significant difference in the differences per conditions (exposure to consistent, inconsistent or no schemata), $F(2,192) = 0.61$, $p = 0.542$, *partial η2* = 0.006.

The covariate was not significant, $F(1,192) = 1.70$, $p = 0.193$, *partial η2* = 0.009. Therefore, a one-way ANOVA was run to test the effects of the conditions without the control of individual creativity. Again there were no differences per condition, $F(2,193) = 0.57$, $p = 0.564$, *partial η2*=0.006.

4.2.3 Creative quality

A one-way ANCOVA was also run to test the differences between groups (exposure to consistent, inconsistent or no schemata) regarding creative quality. This was under control of an individuals' creativity.

First the assumptions of a one-way ANCOVA were tested. There was a linear relationship found between creative quality and an individuals' creativity by visual inspection of a scatterplot. Homogeneity of regression slope was found and the interaction term (condition*individual creativity) was not statistically significant, $F(2,190) = 0.76$, $p = 0.469$. Standardized residuals for the interventions were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). Transforming the variable had no effect and it was therefore chosen to carry on regardless of the fact that the assumption was not met. A one-way ANCOVA is robust to deviations in normality. The sample sizes (number of participants per condition) in this thesis were equal, which means that non-normality does not affect Type I error (probability of rejecting the null hypothesis when it should be accepted) rate substantially (Leard Statistics, n.d.). There was homoscedasticity and homogeneity of variances, which was assessed by a visual inspection of a scatterplot and Levene's test of homogeneity of variance ($p = 0.394$). Six outliers were found in the data and it was tested that these outliers had no effect on the results (an ANCOVA was run without the outliers, which gave no different results) and they were thus included in the test.

Table 7

Adjusted and Unadjusted Intervention Means and Variability for Creative Quality with Individual Creativity as Covariate

		Unadjusted		*Adjusted*	
	N	M	SD	M	SE
Baseline	66	2.4	0.6	2.4	0.1
Consistent	65	2.4	0.6	2.4	0.1
Inconsistent	65	2.4	0.5	2.4	0.1

Note: N=number of participants, M=Mean, SD=Standard Deviation, SE=Standard Error, Consistent=exposure to consistent schemata, Inconsistent= exposure to inconsistent schemata. Creative quality is measured on a 5-point Likert scale

The results of the one-way ANCOVA are presented in *table 7*. The unadjusted means are the means without control of the covariate (individual creativity). The adjusted means are the means under control of the covariate. After adjustment for individual creativity, there was no statistically significant difference in the differences per conditions (exposure to consistent, inconsistent or no schemata), $F(2,192) = 0.11$, $p = 0.897$, *partial η2*=0.001.

The covariate was not significant, $F(1,192) = 0.71$, $p = 0.401$, *partial η2* = 0.004. Therefore, a one-way ANOVA was run to test the effects of the conditions without the control of individual creativity. Again, there were no differences per condition, $F(2,193) = 0,11$ $p = 0.901$, *partial η2* = 0.001.

Creative quality after deleting food categories

Because of the deletion of the answers within the category “Food combination” and “Food related usage” the assumptions of the one-way ANCOVA about creative quality needed to be tested again. A linear relationship was found between creative quality and an individuals’ creativity by visual inspection of a scatterplot. Homogeneity of regression slope was found and the interaction term (condition*individual creativity) was not statistically significant, $F(2,190) = 1.00$, $p = 0.319$. Standardized residuals for the interventions were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). Transforming the variable had no effect. It was thus chosen to carry on regardless of the fact that the assumption was not met. A one-way ANCOVA is robust to deviations in normality. The sample sizes (number of participants per condition) in this thesis were equal, which means that non-normality does not affect Type I error (probability of rejecting the null hypothesis when it should be accepted) rate substantially

(Leard Statistics, n.d.). There was homoscedasticity and homogeneity of variances, this was assessed by a visual inspection of a scatterplot and Levene's test of homogeneity of variance (p = 0.305). Seven outliers were found in the data (standardized residual greater than ±3 standard deviations). It was tested that these outliers had no effect on the results (a one-way ANCOVA was run without the outliers, which gave no different results) and were therefore included in the test.

Table 8

Adjusted and Unadjusted Intervention Means and Variability for Creative Quality with Individual Creativity as Covariate (after deleting food categories)

		Unadjusted		*Adjusted*	
	N	M	SD	M	SE
Baseline	66	2.4	0.6	2.4	0.1
Consistent	65	2.4	0.7	2.4	0.1
Inconsistent	65	2.4	0.6	2.4	0.1

Note: N=number of participants, M=Mean, SD=Standard Deviation, SE=Standard Error, Consistent=exposure to consistent schemata, Inconsistent= exposure to inconsistent schemata. Number of ideas is measured as total number of ideas.

The results of the one-way ANCOVA are presented in *table 8*. The unadjusted means are the means without control of the covariate (individual creativity). The adjusted means are the means under control of the covariate. After adjustment for individual creativity, there was no statistically significant difference in the differences per conditions (exposure to consistent, inconsistent or no schemata), $F(2,192) = 0.08$, $p = 0.922$, *partial η2* = 0.001.

The covariate was not significant, $F(1,192) = 0.83$, $p = 0.364$, *partial η2* = 0.004. Therefore, a one-way ANOVA was run to test the effects of the conditions without the control of individual creativity. Again, there were no differences per condition, $F(2,193) = 0.07$, p = 0.936, *partial η2* = 0.001.

4.2.4 Summary results task 2

No proof is found that exposure to different schemata has an effect on Idea generation in NPD. No proof was found either after the deletion of the answers in food categories. The number of ideas, flexibility and creative quality were not affected by the differences in exposure to schemata. In the second task no proof was found that supported the hypotheses. Also, there was no proof that individual creativity had a moderating effect. The covariate was not significant in all one-way ANCOVAs.

5. Discussion

This final chapter starts with presenting the key findings and is followed by the theoretical implications, practical implications and the limitations of this research. The chapter ends with a concluding statement regarding this thesis.

5.1 Key findings

Both tasks of the experiment conclude that exposure to inconsistent schemata has no influence on Idea generation in New Product Development (NPD). In the first task it was tested if exposure to inconsistent schemata had an effect on the number of pasta names generated and how they deviated from the example. For both dependent variables there was no significant difference between the three tested conditions. There was still no significant difference after deleting participants that did not fill in any names. In the second task there was also no evidence that exposure to inconsistent schemata had influence on the generation of new ways of using pasta, flexibility in thinking or creative quality of ideas. This was still not the case after deleting ideas that were assigned to food related categories. Hypothesis one: "exposure to inconsistent schemata leads to a higher number of ideas than exposure to consistent schemata, or no exposure to schemata", can be rejected. Also, hypothesis two: "exposure to inconsistent schemata leads to higher creative idea quality than exposure to consistent, or no exposure to schemata", can be rejected. In the experiment there was no positive effect found of exposure to inconsistency that leads to more ideas and higher idea quality.

In all tests conducted, there was no significant effect for the covariate, individual creativity. There was no evidence found that individual creativity influences the relationship between exposure to schemata and Idea generation in NPD. Therefore, hypothesis three: "The relationship between schema (in)consistency and Idea Generation in New Product Development is moderated by an individuals' creativity" can also be rejected.

5.2 Theoretical implications

This thesis adds knowledge by performing an experiment to examine the effects of exposure to (in)consistent schemata on Idea generation for New Product Development. With this thesis it was intended to find a link between schema theory and innovation research, but no link was found. In this research, no effect was found from exposure to (in)consistent schemata on the number and idea quality of ideas generated by customers. For all three conditions tested, the results were similar. Therefore, the results of this thesis are not in line with results of other

research. In research of Ritter et al. (2012) and Gocłowska et al. (2012) it was found that thinking about counter-stereotypes enhanced cognitive flexibility and creative thinking. Yet, in this thesis no similar results were found. Participants that were exposed to inconsistent schemata were not more flexible in their thinking than participants that were exposed to consistent schemata or no schemata. Also, participants in this thesis experienced no effects of exposure to inconsistent schemata on creative quality. An effect that was expected based on research of Miron-Spektor et al. (2011), for they found that paradoxical frames lead to a more creative mindset. Also, schema inconsistency had no influence on the quality of ideas provided or the number of ideas generated during the experiment. A possible explanation for the findings in this thesis, based on a research by Porath and Erez (2009), could be that participants spent their cognitive resources on evaluating the situation, spending time to make sense of the stimulus, or were processing how to respond to the stimulus. This could have resulted in less creative power or too little time to think of with ideas.

Another possible explanation is that, as found in a research by Baer and Oldham (2006), when people experience time pressure, they are less creative. All tasks of the experiment had a time limit of one minute, which could have had as a consequence that not enough ideas were generated to find significant differences between the three conditions.

For this thesis an online experiment was used to gather data. When conducting an online experiment, it is hard to see how well participants were participating in the experiment. The effects of schema inconsistency on creativity in the researches of Ritter et al. (2012), Gocłowska et al. (2012) and Miron-Spektor et al. (2011) were found in lab research. The use of an online experiment could also be the reason that no effects were found in this thesis.

Besides the main findings in this thesis, there was also no moderating effect found from individual trait creativity, which is an effect that could have been expected based on the research of Vissers and Dankbaar (2002). This research stated that individual creativity is important in the ideation phase. Besides explaining the lack of a significant main effect, the research of Baer and Oldham (2006) could also explain why the covariate was not significant. The time pressure (all the tasks during the experiment had a time limit of one minute) could have caused that the differences between creative and less creative participants were smaller than they would have been without setting a time limit.

5.3 Practical implications

At the start of this research it was known that New Product Development is important to companies. In this thesis it was investigated if exposure to schema inconsistency leads to more

qualitative new product ideas. The findings in this thesis suggest one main practical implication. Because the experiment gave no significant results about the question if exposure to schema inconsistent pictures leads to more and higher qualitative ideas generated by customers, it can be stated that exposure to pictures of inconsistent schemata has no effect. Because of this thesis, companies now know that not every form of exposure to inconsistent schema leads to more ideas and ideas of higher quality. The manipulation in this research (exposing participants to consistent and inconsistent pictures) does not produce the expected effects. Including schema inconsistent pictures in online ideation contest, as was done in this research, will not lead to better ideas or eventually a competetive advantage over other companies.

5.4 Limitations and future directions

This thesis has some research limitations, first starting with the research method. It is hard to check if participants were participating seriously and really looked at the (in)consistent pictures when they were presented on the screen. It is possible that participants did not look at their screen during the one minute that the pictures were presented, causing the pictures not to have the expected effect.

A second problem with an online experiment is the question if participants fully understand the task given to them. Some participants did not fill in any ideas. Especially during the second task, where new ways of using pasta needed to be generated, some participants gave answers like eating or combining pasta with some other ingredient. Those answers were given while they were instructed to find other uses for pasta than eating it. Deleting the answers regarding to food still did not give a significant effect. Because there are some disadvantages to online experiments, a possible direction for new research is to test the effects of schema inconsistency on idea generation for NPD in a lab setting, where it can be checked it participants participate in the way they are supposed to do.

Another limitation is that most participants in this thesis were from the social network of the researcher. A consequence of this is that most people were 30 years old or younger (82%). The researcher could have aimed for more diversity in age. The effects of exposure to schema (in)consistency are barely tested on people older than 30. It is possible that the effects differ per age. A direction for research towards the effects of schema (in)consistency on idea generation for NPD can be to test if people who are older than 30 respond differently than people below the age of 30.

Besides the limitations of the research method and sample, the data had limitations as well. All dependent variables were tested and did not satisfy the assumption of normality.

Despite the fact that a one-way MANCOVA or one-way ANCOVA can be run without satisfying this assumption, it could have influenced the result. Like stated in chapter 4, non-normality does not affect the Type I error rate substantially, but it can have influence it. Running the analyses with normal distributed data could have produced different results.

Another limitation is that testing the results of the second task was not done with a one-way MANCOVA. In the second task the assumption that there was no Homogeneity of variances and covariances, which is a critical assumption to proceed with a one-way MANCOVA, was not met. The dependent variables were tested separately with one-way ANCOVAs. Analyzing with a one-way ANCOVA gives less chance to find differences between groups. Because a one-way ANCOVA does not like a one-way MANCOVA optimally combine the multiple dependent measures into a single value maximizing the differences across groups (Hair et al., 2013, p. 670).

In this thesis, exposure to schema (in)consistency is done by exposing participants to pictures in an online ideation contest setting. It is not investigated if different forms of exposure to inconsistent schemata have other effects. Exposure to schema inconsistency can have different effects, two examples are the researches of Gocłowska et al. (2012), where participants needed to describe a schema (in)consistent object with adjectives and the research of Miron-Spektor et al. (2011), where participants were manipulated by reading a description of a craft product and needed to write about features they believed made the product successful (the description was different per condition). Here also lies a suggestion for further research. Further research could attempt to find out if other forms of exposure to inconsistent schema does have effect on the amount and creative quality of ideas generated.

5.5 Concluding statement

In this thesis, an experimental study to examine the effects of exposure to inconsistent schemata on Idea generation for New Product Development (NPD) was conducted. NPD is important for companies to stay ahead of their competitors. Therefore, this research investigates how to gain more advantage by involving customers in the ideation phase. In the experiment, participants needed to generate as many new pasta names and new ways to use pasta as possible. This took place in an online ideation setting after the participants were exposed to one of the three conditions with schema inconsistent, schema consistent or no pictures (baseline). The results of the experiment showed no proof for the hypothesis that the participants generated more or qualitative better ideas after being exposed to schema inconsistent pictures (compared to exposure to consistent pictures or no pictures). Additional research is needed to find out if other

ways of being exposed to inconsistent schemata have an effect on the number and quality of ideas.

References

Baer, M., & Oldham, G. R. (2006). The curvilinear relation between experienced creative time pressure and creativity: Moderating effects of openness to experience and support for creativity. *Journal of Applied Psychology*, *91*(4), 963–970. https://doi.org/10.1037/0021-9010.91.4.963

BBC News. (2000, 11th of June). *BBC News | UK | Heinz to launch green ketchup*. Accessed at 12th of May 2020, http://news.bbc.co.uk/2/hi/uk_news/828847.stm

Bissola, R., Imperatori, B., & Colonel, R. T. (2013). Enhancing the Creative Performance of New Product Teams: An Organizational Configurational Approach. *Journal of Product Innovation Management*, *31*(2), 375–391. https://doi.org/10.1111/jpim.12101

Blauth, M., Mauer, R., & Brettel, M. (2014). Fostering Creativity in New Product Development through Entrepreneurial Decision Making. *Creativity and Innovation Management*, *23*(4), 495–509. https://doi.org/10.1111/caim.12094

Carson, S. H., Peterson, J. B., & Higgins, D. M. (2005). Reliability, Validity, and Factor Structure of the Creative Achievement Questionnaire. *Creativity Research Journal*, *17*(1), 37–50. https://doi.org/10.1207/s15326934crj1701_4

Chesbrough, H. W. (2003). The Era of Open Innovation. *MIT Sloan Management Review*, *44*(3), 35–41. http://search.ebscohost.com.ru.idm.oclc.org/login.aspx?direct=true&db=bth&AN=9547972&site=ehost-live

Cooper, R. G., & Kleinschmidt, E. J. (1987). What makes a new product a winner:* Success factors at the project level . *R&D Management*, *17*(3), 175–189. https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1467-9310.1987.tb00052.x?casa_token=jTqMWfGReiQAAAAA:xVCRiUCpER7MjXTscZWbImtcKvgm8IZY0Qxm1P9AiixXIccRESI8xPFwthCL4TPmq6rSG5KApG7zgdA

Cooper, R. G. (2013). New Products - What Separates The Winners From The Losers and What Drives Success. *PDMA handbook of new product development*, 3–34. https://go.aws/2vJLmHd

Cooper, R. G. (2003). Your NPD portfolio may be harmful to your business's health. *Research Technology Management*, *47*(1). http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.627.8212&rep=rep1&type=pdf

Dandurand, F., Shultz, T. R., & Onishi, K. H. (2008). Comparing online and lab methods in a problem-solving experiment. *Behavior Research Methods*, *40*(2), 428–434. https://doi.org/10.3758/brm.40.2.428

Derry, S. J. (1996). Cognitive schema theory in the constructivist debate. *Educational Psychologist*, *31*(3–4), 163–174. https://doi.org/10.1080/00461520.1996.9653264

Dijksterhuis, A., & Meurs, T. (2006). Where creativity resides: The generative power of unconscious thought. *Consciousness and Cognition*, *15*(1), 135–146. https://doi.org/10.1016/j.concog.2005.04.007

Eisenberg, I. (2011). Lead-User Research for Breakthrough Innovation. *Research-Technology Management*, *54*(1), 50–58. https://doi.org/10.1080/08956308.2011.11657673

Evanschitzky, H., Eisend, M., Calantone, R. J., & Jiang, Y. (2012). Success Factors of Product Innovation: An Updated Meta-Analysis. *Journal of Product Innovation Management*, *29*(S1), 21–37. https://doi.org/10.1111/j.1540-5885.2012.00964.x

Flint, D. J. (2002). Compressing new product success-to-success cycle time. *Industrial Marketing Management*, *31*(4), 305–315. https://doi.org/10.1016/s0019-8501(01)00165-1

Fuchs, C., & Schreier, M. (2010). Customer Empowerment in New Product Development. *Journal of Product Innovation Management*, *28*(1), 17–32. https://doi.org/10.1111/j.1540-5885.2010.00778.x

Gassmann, O. (2006). Opening up the innovation process: towards an agenda. *R and D Management*, *36*(3), 223–228. https://doi.org/10.1111/j.1467-9310.2006.00437.x

Glass, G. V., Peckham, P. D., & Sanders, J. R. (1972). Consequences of Failure to Meet Assumptions Underlying the Fixed Effects Analyses of Variance and Covariance. *Review of Educational Research*, *42*(3), 237–288. https://doi.org/10.3102/00346543042003237

Gocłowska, M. A., Baas, M., Crisp, R. J., & De Dreu, C. K. W. (2014). Whether Social Schema Violations Help or Hurt Creativity Depends on Need for Structure. *Personality and Social Psychology Bulletin*, *40*(8), 959–971. https://doi.org/10.1177/0146167214533132

Gocłowska, M. A., Crisp, R. J., & Labuschagne, K. (2012). Can counter-stereotypes boost flexible thinking? *Group Processes & Intergroup Relations*, *16*(2), 217–231. https://doi.org/10.1177/1368430212445076

Grönlund, J., Sjödin, D. R., & Frishammar, J. (2010). Open Innovation and the Stage-Gate Process: A Revised Model for New Product Development. *California Management Review*, *52*(3), 106–131. https://doi.org/10.1525/cmr.2010.52.3.106

Gruner, K. E., & Homburg, C. (2000). Does Customer Interaction Enhance New Product Success? *Journal of Business Research*, *49*(1), 1–14. https://doi.org/10.1016/s0148-2963(99)00013-2

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate Data Analysis* (7th edition). Harlow, England: Pearson Education Limited.

Heine, S. J., Proulx, T., & Vohs, K. D. (2006). The Meaning Maintenance Model: On the Coherence of Social Motivations. *Personality and Social Psychology Review*, *10*(2), 88–110. https://doi.org/10.1207/s15327957pspr1002_1

Henard, D. H., & Szymanski, D. M. (2001). Why Some New Products are More Successful than Others. *Journal of Marketing Research*, *38*(3), 362–375. https://doi.org/10.1509/jmkr.38.3.362.18861

Hennessey, B. A., & Amabile, T. M. (2010). Creativity. *Annual Review of Psychology*, *61*(1), 569–598. https://doi.org/10.1146/annurev.psych.093008.100416

Hillebrand, B., Kemp, R. G. M., & Nijssen, E. J. (2011). Customer orientation and future market focus in NSD. *Journal of Service Management*, *22*(1), 67–84. https://doi.org/10.1108/09564231111106929

Hossain, M. (2012). Performance and Potential of Open Innovation Intermediaries. *Procedia - Social and Behavioral Sciences*, *58*, 754–764. https://doi.org/10.1016/j.sbspro.2012.09.1053

Hoyer, W. D., Chandy, R., Dorotic, M., Krafft, M., & Singh, S. S. (2010). Consumer Cocreation in New Product Development. *Journal of Service Research*, *13*(3), 283–296. https://doi.org/10.1177/1094670510375604

Hoyer, W. D., MacInnis, D. J., & Pieters, R. (2016). *Consumer Behavior* (7th edition). United States: Cengage Learning.

Jobs, S. (1998, 25th of May). *Steve Jobs: `There's Sanity Returning'*. Bloomberg. Accessed on 29th of April 2020, https://www.bloomberg.com/news/articles/1998-05-25/steve-jobs-theres-sanity-returning

Johnson, M. D., & Kirchain, R. E. (2011). The importance of product development cycle time and cost in the development of product families. *Journal of Engineering Design*, *22*(2), 87–112. https://doi.org/10.1080/09544820902960058

Kaplan, A. M., & Haenlein, M. (2006). Toward a Parsimonious Definition of Traditional and Electronic Mass Customization. *Journal of Product Innovation Management*, *23*(2), 168–182. https://doi.org/10.1111/j.1540-5885.2006.00190.x

King, A., & Lakhani, Karim. R. (2013). Using Open Innovation to Identify the Best Ideas. *MITSloan Management Review*, *55*(1), 41–48.

https://www.researchgate.net/publication/257526888_Using_Open_Innovation_to_Identify_the_Best_Ideas

Krishnan, V., & Ulrich, K. T. (2001). Product Development Decisions: A Review of the Literature. *Management Science*, 47(1), 1–21. https://doi.org/10.1287/mnsc.47.1.1.10668

Laerd Statistics. (n.d.). *Background & Requirements*. Accessed at May 26th 2020, https://statistics.laerd.com/premium/spss/owmanc/one-way-mancova-in-spss-3.php#choosing-owmanc-and-not-multiple-owanc

Leard Statistics. (n.d.). *Testing for normality*. Accessed at May 27th 2020, https://statistics.laerd.com/premium/spss/a/one-way-ancova-in-spss-11.php

Lagrosen, S. (2001). Strengthening the weakest link of TQM – from customer focus to customer understanding. *The TQM Magazine*, *13*(5), 348–354. https://doi.org/10.1108/09544780110401916

Leonard, D., & Rayport, J. F. (1997). Spark innovation through empathic design. *Harvard business review*, *75*(6), 102–113. http://web.b.ebscohost.com.ru.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=1&sid=874ed807-7ea1-4aeb-80ae-e43ed55ba642%40pdc-v-sessmgr03

Mahr, D., Lievens, A., & Blazevic, V. (2013). The Value of Customer Cocreated Knowledge during the Innovation Process. *Journal of Product Innovation Management*, *31*(3), 599–615. https://doi.org/10.1111/jpim.12116

Mardia, K. V. (1971). The effect of nonnormality on some multivariate tests and robustness to nonnormality in the linear model. *Biometrika*, *58*(1), 105–121. https://doi.org/10.1093/biomet/58.1.105

Mendes, W. B., Blascovich, J., Hunter, S. B., Lickel, B., & Jost, J. T. (2007). Threatened by the unexpected: Physiological responses during social interactions with expectancy-violating partners. *Journal of Personality and Social Psychology*, *92*(4), 698–716. https://doi.org/10.1037/0022-3514.92.4.698

Miron-Spektor, E., Gino, F., & Argote, L. (2011). Paradoxical frames and creative sparks: Enhancing individual creativity through conflict and integration. *Organizational Behavior and Human Decision Processes*, *116*(2), 229–240. https://doi.org/10.1016/j.obhdp.2011.03.006

Mukhtar, M., Ismail, M. N., & Yahya, Y. (2012). A hierarchical classification of co-creation models and techniques to aid in product or service design. *Computers in Industry*, *63*(4), 289–297. https://doi.org/10.1016/j.compind.2012.02.012

Neuschatz, J. S., Lampinen, J. M., Preston, E. L., Hawkins, E. R., & Toglia, M. P. (2002). The effect of memory schemata on memory and the phenomenological experience of naturalistic situations. *Applied Cognitive Psychology*, *16*(6), 687–708. https://doi.org/10.1002/acp.824

Porath, C. L., & Erez, A. (2009). Overlooked but not untouched: How rudeness reduces onlookers' performance on routine and creative tasks. *Organizational Behavior and Human Decision Processes*, *109*(1), 29–44. https://doi.org/10.1016/j.obhdp.2009.01.003

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, *18*(3), 5–14. https://doi.org/10.1002/dir.20015

Reips, U.-D. (2000). The Web Experiment Method. *In Psychological Experiments on the Internet*, 89–117. Academic Press https://doi.org/10.1016/b978-012099980-4/50005-8

Reips, U.-D. (2002). Standards for Internet-Based Experimenting. *Experimental Psychology*, *49*(4), 243–256. https://doi.org/10.1026//1618-3169.49.4.243

Ritter, S. M., Damian, R. I., Simonton, D. K., van Baaren, R. B., Strick, M., Derks, J., & Dijksterhuis, A. (2012). Diversifying experiences enhance cognitive flexibility. *Journal of Experimental Social Psychology*, *48*(4), 961–964. https://doi.org/10.1016/j.jesp.2012.02.009

Ritter, S. M., van Baaren, R. B., & Dijksterhuis, A. (2012). Creativity: The role of unconscious processes in idea generation and idea selection. *Thinking Skills and Creativity*, *7*(1), 21–27. https://doi.org/10.1016/j.tsc.2011.12.002

Rumelhart, D. E. (2017). Schemata: The Building Blocks of Cognition. In R.J. Spiro, B.C. Bruce, & W.F. Brewer., *Theoretical Issues in Reading Comprehension* (1st edition, 26-49). Hillsdale New Jersey: Lawrence Erlbaum Associates, Inc.

Salgado, J. F., & Moscoso, S. (2003). Internet-based Personality Testing: Equivalence of Measures and Assesses' Perceptions and Reactions. *International Journal of Selection and Assessment*, *11*(2–3), 194–205. https://doi.org/10.1111/1468-2389.00243

Sawhney, M., Verona, G., & Prandelli, E. (2005). Collaborating to create: The Internet as a platform for customer engagement in product innovation. *Journal of Interactive Marketing*, *19*(4), 4–17. https://doi.org/10.1002/dir.20046

Scanlon, J., & Jana, R. (2007, 19th December). *The State of Innovation*. Bloomberg. Accessed at 20th March 2020, https://www.bloomberg.com/news/articles/2007-12-19/the-state-of-innovationbusinessweek-business-news-stock-market-and-financial-advice

Snyder, A. (2004). Nonconscious Idea Generation. *Psychological Reports*, *94*(3), 1325. https://doi.org/10.2466/pr0.94.3.1325-1330

Taylor, N., & Noseworthy, T. J. (2019). Compensating for Innovation: Extreme Product Incongruity Encourages Consumers to Affirm Unrelated Consumption Schemas. *Journal of Consumer Psychology*, *30*(1), 77–95. https://doi.org/10.1002/jcpy.1127

Ulwick, A. W. (2002). Turn Customer Input into Innovation. *Harvard business review*, *80*(1), 91–98. https://static1.squarespace.com/static/5ba7b499755be22c410b1cae/t/5d62d7f9c388aa0001ba7f20/1566758906160/Turn+Customer+Input+into+Innovation.pdf

Van Kleef, E., van Trijp, H. C. M., & Luning, P. (2005). Consumer research in the early stages of new product development: a critical review of methods and techniques. *Food Quality and Preference*, *16*(3), 181–201. https://doi.org/10.1016/j.foodqual.2004.05.012

Vissers, G., & Dankbaar, B. (2002). Creativity in Multidisciplinary New Product Development Teams. *Creativity and Innovation Management*, *11*(1), 31–42. https://doi.org/10.1111/1467-8691.00234

von Hippel, E. (2005). *Democratizing Innovation* (1st edition). Cambridge, Massachusetts, United States: MIT Press.

von Hippel, E. (1987). Lead users: A source of novel product concepts. *Journal of Product Innovation Management*, *4*(2), 158. https://doi.org/10.1016/0737-6782(87)90069-5

von Hippel, E. (2001). User toolkits for innovation. *Journal of Product Innovation Management*, *18*(4), 247–257. https://doi.org/10.1111/1540-5885.1840247

Wagoner, B. (2013). Bartlett's concept of schema in reconstruction. *Theory & Psychology*, *23*(5), 553–575. https://doi.org/10.1177/0959354313500166

Walter, T., & Back, A. (2011). Towards measuring crowdsourcing success: An empirical study on effects of external factors in online idea contest. *Institute of Information Management*, 1–12. https://www.alexandria.unisg.ch/214388/1/MCIS_Walter_Back_2011.pdf

Wan, W. W. N., & Chiu, C.-Y. (2002). Effects of Novel Conceptual Combination on Creativity. *The Journal of Creative Behavior*, *36*(4), 227–240. https://doi.org/10.1002/j.2162-6057.2002.tb01066.x

Woody, J. M., & Phillips, J. (1995). Freud's "Project for a Scientific Psychology" After 100 Years: The Unconscious Mind in the Era of Cognitive Neuroscience. *Philosophy, Psychiatry, & Psychology*, *2*(2), 123–134. https://muse.jhu.edu/article/245083/pdf

Yang, Y., Chen, P., & Banker, R. (2010). Impact of Past Performance and Strategic Bidding on Winner Determination of Open Innovation Contest. *Electronic Markets*, 1–29. https://pdfs.semanticscholar.org/c7fa/541964159511af697b9326df53eb498aa227.pdf

Yang, Y., Chen, P., & Pavlou, P. (2009). Open Innovation: An Empirical Study of Online Contests. *ICIS 2009 Proceedings*, *13*, 1–15. https://pdfs.semanticscholar.org/d7fa/f8959b8c04f0ac6b8437248ca93c4830bc0e.pdf

Zhiqing, Z. (2015). Assimilation, Accommodation, and Equilibration: A Schema-Based Perspective on Translation as Process and as Product. *International Forum of Teaching and Studies*, *11*(1/2), 84. http://americanscholarspress.us/journals/IFST/pdf/IFOTS-2-2015/v11n2-art9.pdf

Appendix I: Category list

The category list is predefined by the raters, with approval of the supervisor (S.M Ritter).

	Categories
	New ideas of using pasta
A	Personal decoration
B	Games
C	Home decoration
D	Food combination
E	Food related usage
F	Charity
G	Art
H	Construction
I	Religion
J	Sports
K	Science
L	Fun
M	Tool
N	Measure
O	Transport
P	Other

Appendix II: Creative Achievement Questionnaire

Place a check mark beside sentences that apply to you. Next to sentences with an asterisk (*), write the number of times this sentence applies to you.

A. Visual Arts (painting, sculpture)

__ 0. I have no training or recognized talent in this area.
__1. I have taken lessons in this area.
__2. People have commented on my talent in this area.
__3. I have won a prize or prizes at a juried art show.
__4. I have had a showing of my work in a gallery.
__5. I have sold a piece of my work.
__6. My work has been critiqued in local publications.
*__7. My work has been critiqued in national publications.

B. Music

__0. I have no training or recognized talent in this area.
__1. I play one or more musical instruments proficiently.
__2. I have played with a recognized orchestra or band.
__3. I have composed an original piece of music.
__4. My musical talent has been critiqued in a local publication.
__5. My composition has been recorded.
__6. Recordings of my composition have been sold publicly.
*__7. My compositions have been critiqued in a national publication.

C. Dance

__0. I have no training or recognized talent in this area.
__1. I have danced with a recognized dance company.
__2. I have choreographed an original dance number.
__3. My choreography has been performed publicly.
__4. My dance abilities have been critiqued in a local publication.
__5. I have choreographed dance professionally.
__6. My choreography has been recognized by a local publication.
*__7. My choreography has been recognized by a national publication

D. Architectural Design

__0. I do not have training or recognized talent in this area.

__1. I have designed an original structure.

__2. A structure designed by me has been constructed.

__3. I have sold an original architectural design.

__4. A structure that I have designed and sold has been built professionally.

__5. My architectural design has won an award or awards.

__ 6. My architectural design has been recognized in a local publication.

*__7. My architectural design has been recognized in a national publication.

E. Creative Writing

__0. I do not have training or recognized talent in this area.

__1. I have written an original short work (poem or short story).

__2. My work has won an award or prize.

__3. I have written an original long work (epic, novel, or play).

__4. I have sold my work to a publisher.

__5. My work has been printed and sold publicly.

__6. My work has been reviewed in local publications.

*__7. My work has been reviewed in national publications.

F. Humor

__0. I do not have recognized talent in this area.

__1. People have often commented on my original sense of humor.

__2. I have created jokes that are now regularly repeated by others.

__3. I have written jokes for other people.

__ 4. I have written a joke or cartoon that has been published.

__5. I have worked as a professional comedian.

__6. I have worked as a professional comedy writer.

__7. My humor has been recognized in a national publication.

G. Inventions

__0. I do not have recognized talent in this area.

__1. I regularly find novel uses for household objects.

__2. I have sketched out an invention and worked on its design flaws.

__3. I have created original software for a computer.

__4. I have built a prototype of one of my designed inventions.

__5. I have sold one of my inventions to people I know.

*__6. I have received a patent for one of my inventions.

*__7. I have sold one of my inventions to a manufacturing firm.

H. Scientific Discovery

__0. I do not have training or recognized ability in this field.

__1. I often think about ways that scientific problems could be solved.

__2. I have won a prize at a science fair or other local competition.

__3. I have received a scholarship based on my work in science or medicine.

__4. I have been author or coauthor of a study published in a scientific journal.

*__5. I have won a national prize in the field of science or medicine.

*__6. I have received a grant to pursue my work in science or medicine.

__7. My work has been cited by other scientists in national publications.

I. Theater and Film

__0. I do not have training or recognized ability in this field.

__1. I have performed in theater or film.

__2. My acting abilities have been recognized in a local publication.

__3. I have directed or produced a theater or film production.

__4. I have won an award or prize for acting in theater or film.

__5. I have been paid to act in theater or film.

__6. I have been paid to direct a theater or film production.

*__7. My theatrical work has been recognized in a national publication.

J. Culinary Arts

__0. I do not have training or experience in this field.

__1. I often experiment with recipes.

__2. My recipes have been published in a local cook book.

__3. My recipes have been used in restaurants or other public venues.

__4. I have been asked to prepare food for celebrities or dignitaries.

__5. My recipes have won a prize or award.

__6. I have received a degree in culinary arts.

*__7. My recipes have been published nationally

(Carson et al., 2005)