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A comparison of two frameworks for Business Model Ideation

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Abstract

Creativity is widely acknowledged as a necessary ingredient of innovation. Given the importance of innovation in Business Models, managers should take action to stimulate the employees' creativity. Managers can facilitate the generation of creative innovation ideas by using Business Model frameworks. However, there is limited empirical research on the effects of using Business Model frameworks to facilitate the generation of innovation ideas. In this thesis, we have studied the effects of using the Business Model Canvas and Doblin's Ten Types of Innovation to generate innovation ideas.

To study the effects, we conducted an experiment using 105 business students from the Norwegian School of Economics (NHH), where we tested the frameworks ability to facilitate idea generation. The participants in our study were asked to generate as many ideas as possible to solve a fictive business case. We measured the quantity, creativity, and value of the generated innovation ideas. Furthermore, we operationalized the creativity of the innovation ideas into *originality*, *implementability*, *applicability*, and *effectiveness*. We operationalized the value of the innovation ideas into *priority*. The results from the experiment were compared to a control group that did not have any Business Model framework to aid them in the ideation.

The empirical contributions from the experiment show that one of the hypotheses was supported. We did not find any significant effect from using the BMC or the Ten Types for ideation, compared to the free ideation control group. However, we did find that the Ten Types framework produced innovation ideas that scored significantly higher on *originality* and *priority*, than the BMC framework. We also find that the participants' experience with the Ten Types framework is a moderating variable affecting the *effectiveness* score of the innovation ideas generated with the Ten Types framework.

The literature review and the discussion of the results have provided several theoretical contributions that are highly relevant for scholars and managers. The empirical contributions highlight that the Ten Types framework should be included in further research, and that managers should incorporate the framework in their innovation work.

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1 Introduction

Top executives in large Norwegian companies like DNB and Telenor have forecasted significant changes in the years that lie ahead. The leader of DNB, Rune Bjerke, claimed that DNB is transforming into a technology company, and must reduce their employee count by 50 percent within five years. The CEO of Telenor, Sigve Brekke, believes that Telenor might not even exist in ten years. It follows that businesses are in demand for innovative practices. In fact, most industries will be disrupted and challenged by novel business models (Carlsen, 2017). According to Osterwalder & Pigneur (2010), executives, practitioners, and academics need to question possibly outdated business models, and learn to innovate systematically by developing, shaping, and implementing new business models.

To innovate systematically is a challenging and vital task for both corporate managers and entrepreneurs. The Center for Service Innovation (CSI), at the Norwegian School of Economics (NHH), has identified a research gap in the field of Business Model Innovation (BMI). The majority of the current research on BMI is conceptual, and there is a lack of empirical research in the field (CSI, 2018). We followed up on this research gap and found that hardly any empirical testing of BMI and Business Model frameworks exists. We will address this research gap by producing empirical evidence on the effects of using the Business Model Canvas (BMC), and Doblin's Ten Types of Innovation (Ten Types), to generate innovation ideas that can solve a specific challenge for a company and innovate the Business Model (BM).

1.1 Objective and research question

Our objective is to address the research gap discussed in the previous section, by producing empirical evidence on the effects of using two different BM frameworks. In this thesis we have focused on *corporate entrepreneurship*, which can be distinguished from *entrepreneurship* in a startup venture (Tidd & Bessant, 2013). We have focus on the idea generation phase of BMI, where companies often use BM frameworks to facilitate the generation of new ideas.

According to Girotra & Netessine (2014), knowledge and application of BM frameworks are essential factors when innovating in a business model. Several BM frameworks can help companies to generate innovation ideas. Decision-makers should make an informed decision

when deciding what framework is most suited for their company, and the situation or challenge that the company is facing. However, there is a significant amount of BM frameworks available, and the theoretical landscape is currently both dispersed and inconclusive. Consequently, we found it necessary to provide an overview of the theoretical landscape to offer a deeper and broader conceptual understanding for decision-makers.

For our empirical contribution, we conducted an experiment to test the frameworks ability to facilitate the generation of creative and valuable innovation ideas. We operationalized the creativity into four dimensions: *originality*, *implementability*, *applicability* and *effectiveness* (Dean et al., 2006). For the value of the innovation ideas, we operationalized it as the *priority* given to the ideas by a professional business developer. In addition to the creativity and value of the business ideas, we also measured the quantity and perceived creativity of the innovation ideas. In this context, we think of innovation ideas as innovative ideas that are generated to solve a specific problem. We compare the results from using the frameworks as idea generation tools to a control group that was not facilitated by any BM framework, which we refer to as the *free ideation group*. In this thesis, we use ideation and idea generation interchangeably. We will use a professional business developer from Bergen Technology Transfer (BTO), to rate the creativity of the innovation ideas generated. Based on the research gap identified and the previous paragraphs, we have developed the following research question:

What is the effect of using the Business Model Canvas and Doblin's Ten Types of Innovation as idea generation tools on the quantity, creativity, and value of innovation ideas produced to solve a business case?

In this thesis, we have chosen to focus on an inside-out approach to BMI. This approach entails that the participants of our study first discover the organization's current business model, then reflect on potential changes to the model. We will give the participants a concrete task that they have to solve, by innovating in the BM of a fictive company.

1.2 Thesis structure

To give a quick overview of the thesis structure, we have provided a table as can be seen below. The table illustrates the logical structure of how the chapters are built up, from the beginning to the end of the thesis.

Chapter 2 Theory	Presentation and discussion of literature on business models, business model innovation, creativity, and idea generation
Chapter 3 Hypotheses	Presentation of Hypotheses
Chapter 4 Research model	The research model is presented with the different variables and relationships studied in the experiement
Chapter 5 Research design	The research design used to answer the research question is presented and discussed
Chapter 6 Research results	Presentation of the research results from the hypothesis testing including additional findings
Chapter 7 Discussion of results	The theoretical and manegerial implications of the research results are discussed including ethichal considerations
Chapter 8 Limitations and further research	The limitations of the research are discussed and further research suggestions are presented
Chapter 9 Concluding remarks	Concluding remarks are made in the light of the findings from the research and the research question is answered
Chapter 10 References	References in APA sixth
Chapter 11 Appendix	Appendix with all additional material from the thesis

Table 1.1: Thesis structure

2 Literature review

In this chapter, we will introduce and discuss the relevant literature for this master thesis. We will first present literature on the subjects of business models, business model innovation, and business model frameworks. Second, we will present and compare our two selected BM frameworks for the experiment, the Business Model Canvas (Osterwalder & Pigneur, 2010) and Doblin's Ten Types of Innovation (Keeley, Pikkel, Quinn & Walters, 2013). Third, we will explain the concept of creativity in relation to innovation and business model ideas and elaborate on the idea generation phase of innovation.

2.1 Business Models (BM)

2.1.1 Business Model Definitions

The concept of Business Models has been used and cited by scholars since the birth of the internet, in the mid 90's. Since then, both academics and practitioners have increasingly discussed business models. In an overview paper on the concept, Zott, Amit & Massa (2011) claim that scholars have yet to agree on a precise definition of what a business model is. Scholars have referred to the BM as a statement, a description, a representation, an architecture, a tool, a structural template, and a pattern (Zott et al., 2011). From the literature, we see that there is no consensus on the definition of a business model (Morris, Schindehutte, Richardson & Allen, 2006; Fielt, 2013).

Definitions of business models are many and can be more or less inclusive (Fielt, 2013). Magretta (2002) was one of the first to define the business model and described it as "stories that explain how enterprises work" (p. 87). Magretta further adds that a good business model should answer fundamental questions like who the customer is, what the customer values, and how the company can make money. This definition is centered around value creation, value delivery, and value capture. Another often cited definition of business models is, "the rationale of how an organization creates, captures and delivers value" (Osterwalder & Pigneur, 2010). A quite similar definition is given by Teece (2010), he defines a BM as "how the firm creates and delivers value to customers, and then converts it into profits" (p. 173). Morris, Schindehutte & Allen (2005) define the BM as "a concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create a sustainable competitive advantage in defined markets" (p. 727). The definition of Morris et al. (2005) differs in that they link the BM concept with

Michael Porter's well-known strategy concept of sustainable competitive advantage (Porter, 1996). The definition also varies in that they do not use the terms value creation, value capture, and value deliver; instead they focus on an interrelated set of decision variables, with linkages or interdependencies within the BM (Morris et al., 2005).

The current research on BM 's tends to be descriptive and conceptual, whereas the empirical work is limited. Scholars have often proposed normative approaches to model construction, based on the study of successful and failed business models, where they have tried to identify causes of success and failure (Morris et al., 2006). Fielt (2013) claims that conceptual BM's have been the core focus of researchers so far and that they have done very little empirical research.

2.1.2 Common scholarly perspectives

Although a great diversity of definitions exists, there are some common themes and perspectives on BMs' in the literature (Zott et al., 2011). Zott et al. (2011) argue that most scholars agree on that a business model is a holistic approach to how a company does business. Moreover, the BM allows for a systemic perspective on what businesses do and how they do it (Zott et al., 2011). Manceau & Morand (2014) conceptualize the BM as a multi-faceted concept, which facilitates a holistic approach to innovation. The view on the BM as a holistic approach is supported by Fielt (2013) when he states that "a company's description of its BM should provide a holistic understanding of how the company creates and captures customer value" (p. 99).

Morris et al. (2006), discussed business models as a unit of analysis and innovation, as opposed to a unit for the product, service or process. The BM can function as a unifying unit of analysis comprising value creation from multiple sources (Morris et al., 2006). There is now a widespread acknowledgment of the BM as a unit for analysis and a potential unit for innovation. The perspective of the BM as a unit of analysis eventually led to the emerging literature on business model innovation (Zott et al., 2011). We have provided a few selected definitions of BMs' in the table on the next page. In the next section, we will discuss Business Model Innovation, a concept that is closely related to business models.

Table 2.1: Selective overview of BM definitions	
Author(s)	**Definition**
Magretta (2002)	"Stories that explain how enterprises work." (p. 87)
Morris, Schindehutte & Allen (2005)	"Business model is a concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets." (p. 727)
Shafer, Smith, & Linder (2005)	"We define a business model as a representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network." (p. 202)
Casadesus-Masanell & Ricart (2007)	"A business model is defined as a company's choice of policies and assets, the governance structure of those policies and assets, and their consequences, whether flexible or rigid." (p.1)
Teece (2010)	"In short, a business model defines how the enterprise creates and delivers value to customers, and then converts payments received to profits." (p. 173)
Osterwalder & Pigneur (2010)	"The rationale of how an organization creates, delivers and captures value." (p. 14)
Zott, Amit & Massa (2011)	"A business model can be viewed as a template of how a firm conducts business, how it delivers value to stakeholders (e.g., the focal firms, customers, partners, etc.), and how it links factor and product markets. The activity systems perspective addresses all these vital issues [...]." (p. 222)
Gerard & Bock (2011)	"The BM is both an enabling and limiting structure for the firm's accumulation and deployment of resources." (p. 99)

Table 2.1: BM definitions

2.2 Business Model Innovation (BMI)

2.2.1 BMI definitions

Definitions of BMI are as diverse as those of BM's, and scholars do not agree on a single definition. BMI has been described as the process of finding a novel way of doing business, which results in a reconfiguration of value creation and value capturing mechanisms (Bashir & Verma, 2017). Based on a comprehensive literature review of 150 scholarly publications on BMI, Foss & Saebi (2017) define BMI as "designed, novel, non-trivial changes to the

key elements of a firm's business model and the architecture linking these elements" (p. 201).

Foss & Saebi (2017) introduce three requirements for innovation to be characterized as BMI. First, the scholars require that BMI is designed, meaning that it is of strategic nature, and involves the top-management in the firm. Second, they demand that the innovation is novel, which means that the innovation cannot adopt or imitate other BM's. Finally, the scholars expect that BMI is non-trivial, declaring that minor, trivial changes in the BM do not count as BMI (Foss & Saebi, 2017).

2.2.2 The significance of BMI

Researchers, scholars and top executives unanimously approve that BMI is a new form of innovation which is distinct from product, service and process innovation (Bashir & Verma, 2017). A large number of scholars focus on BMI as a vehicle for corporate transformation and renewal (Zott et al., 2011). More companies are now turning towards BMI as an alternative to product and process innovation. Amit & Zott (2012) argue that even if companies are turning towards BMI, it is still an under-utilized source of future value for the firm. Among scholars, there is increasing agreement that BMI is essential for firm performance.

In 2006, IBM conducted a global study and interviewed over 750 corporate and public sector leaders on the subject of innovation. Researchers found that companies whose operating margins had grown faster than their competitors' over the previous five years, were twice as likely to emphasize Business Model Innovation, as opposed to product or process innovation (Amit & Zott, 2012). Furthermore, the scholars argue that BMI can be more valuable, as it is more difficult for competitors to imitate or replicate an entirely new business model than to imitate a new product or service. Therefore, innovation at the Business Model level can sometimes lead to a sustainable competitive advantage (Amit & Zott, 2012). We have provided a few selected definitions of BMI in the table on the next page.

Table 2.2: Selective overview of BMI definitions	
Author(s)	**Definition**
Markides (2006)	"Business model innovation is the discovery of a fundamentally different business model in an existing business." (p. 20)
Santos, Spector & Van der Heyden (2009)	"Business model innovation is a reconfiguration of activities in the existing business model of a firm that is new to the product service market in which the firm competes." (p. 14)
Yunus, Bertrand & Lehmann-Ortega (2010)	"Business model innovation is about generating new sources of profit by finding novel proposition/value constellation combinations" (p. 312)
Casadesus-Masanell and Zhu (2013)	"At root, business model innovation refers to the search for new logics of the firm and new ways to create and capture value for its stakeholders; it focuses primarily on finding new ways to generate revenues and define value propositions for customers, suppliers and partners." (p. 464)
Khanagha, Volberda & Oshri (2014)	"Business model innovation activities can range from incremental changes in individual components of business models, extension of the existing business model, introduction of parallel business model, right through to disruption of the business model, which may potentially entail replacing the existing model with a fundamentally different one." (p. 324)
Foss and Saebi (2017)	"We define a BMI as "designed, novel, and nontrivial changes to the key elements of a firm's BM and the architecture linking these elements." (p. 216)

Table 2.2: BMI definitions

2.2.3 Challenges with current research

Although discussed in separate chapters in this thesis, BM's and BMI should not be treated as two independent streams of research. Scholars consider the BMI literature as a new branch of the BM literature (Foss & Saebi, 2017). The research on BMI is at a growing stage, and the literature on BMI is still a small field (Bashir & Verma, 2017). Considerable academic research remains to properly understand BMI (Morris, Schindehutte & Allen, 2005).

Foss & Saebi (2017) claims there are many misconceptions regarding BM's and BMI, which hinder cumulativeness in the BMI literature, such as systematic research on the antecedents,

moderators, and implications of BMI being scarce. Furthermore, the lack of construct clarity and operationalizations make empirical testing difficult. These factors act as hinders for cumulativeness in the BMI literature (Foss & Saebi, 2017). Further empirical studies on BMI is necessary to advance the field (Bashir & Verma, 2017). The same challenges and characteristics have been identified in the field of Business Models (Zott et al., 2011). According to Fielt (2013), the research in the BM field is often characterized as descriptive and conceptual, with limited empirical studies.

2.3 BM Frameworks

2.3.1 Why we use BM Frameworks

We choose to use the term BM frameworks, where we consider the framework as a tool for ideation and innovation in the business model, however, that is not the only purpose. BM frameworks can be used solely to describe, visualize and assess the current state of the business model, with no intention to change or innovate (Fielt, 2013). The use of BM frameworks can be helpful when innovating in a business model, as a framework works as a more precise conceptualization of the BM concept. The framework allows visualization and communication among the practitioners. The framework should be relatively simple, comprehensive, logical, and measurable to be useful. A challenge is to develop a framework that applies to most firms, and simultaneously serves the individual needs of the different firms (Morris et al., 2005).

2.3.2 Elements and interdependencies

BM frameworks depict the *elements* of business models and the relationship between these elements, also sometimes referred to as the building blocks or components of the business model (Osterwalder & Pigneur, 2010). Within each component or element, considerable scope for innovation exists (Morris et al., 2005). The exact nature of these elements vary between different frameworks, but there are significant similarities and several elements that recur. Morris et al. (2005) conducted a study comparing 18 frameworks. The scholars found that the number of elements varies from four to eight, with a total of 24 different items as possible elements, and 15 of them receiving multiple mentions.

Fielt (2013) suggest that four specific core elements should be addressed in BM frameworks. These core elements are the customer, the value proposition, the organizational architecture, and the economics of the organization. The elements can be analyzed sequentially or like a

story. First, the organization identifies a customer need or problem to be solved (Christensen, Hall, Dillon & Duncan, 2016). Second, a value proposition is proposed as a solution to the problem of the customer. Third, the organization must configure its capabilities and resources to effectuate this value proposition. Finally, the company must take the necessary financial considerations into account (Fielt, 2013).

As well as depicting the elements of the business model, the framework should also describe the relationships between the elements. The framework should capture how key decision variables are integrated and how they can be uniquely combined (Morris et al., 2005). A BM framework is not merely a list of the firm's mechanisms for creating, delivering and capturing value. The BM framework should also focus on the linkages between essential activities for value creation, delivering and capturing (Santos, Specter & Van der Heyden, 2009). It is important to recognize that a BM framework is more than the sum of its parts, it should capture the interrelated decision variables. Fielt (2013) emphasize the importance of the relationship between the elements and suggests that the most robust business models' create synergies between the elements. Moreover, Fielt (2013) state that there is a lack of empirical testing of BM frameworks and their elements and that there is little evidence on the differences and expected effects of using BM frameworks and elements.

2.3.3 Selective comparison of BM frameworks

It is not uncommon that scholars propose new frameworks, which often share significant similarities with previous frameworks, but with some revisions. We have composed a list of 30 BM frameworks from our literature review and provided it in appendix 11.1. By studying the sheer amount of different BM frameworks in the list, we can discern that the field of business models is still very inconclusive. Our list of frameworks has been composed from three different overview articles and shows the author, year, and components included in the framework. From this list, we have selected five frameworks which represent a diversity that we will discuss and compare in the following paragraphs. The Business Model Canvas and Doblin's Ten Types of Innovations will be addressed briefly in the two next paragraphs, and then discussed thoroughly in chapter 2.4 and 2.5.

The Business Model Canvas

The most well-known and widely used framework is the Business Model Canvas by Osterwalder & Pigneur (Fielt, 2013). The Business Model Canvas has been inspired by

design thinking and is presented as a language for describing, visualizing, assessing and changing business models (Fielt, 2013). BMC serves as a visual and practical tool to facilitate discussion, analysis, and creativity (Osterwalder & Pigneur, 2010). Furthermore, visual thinking can stimulate a holistic approach to BMI (Fielt, 2013). The purpose is to depict the current state of the firm's business model by filling the boxes of the canvas. The logical layout of the BMC can stimulate visual thinking and help the user to innovate by changing the input in one or more of the elements of the canvas.

Doblin's Ten Types of Innovation

The Doblin Ten Types of Innovations framework was developed by the consultancy firm Doblin, which is a branch of Deloitte Consulting. The Ten Types of Innovation framework can help companies to look past traditional product innovation, and use multiple sources of innovation. The framework introduces ten different innovation types that can be combined in multiple ways to create a competitive advantage (Tuff, 2017). According to Doblin, the biggest reason why innovations fail comes from lack of discipline. Building innovations systematically through the Ten Types framework, allows for a more disciplined approach to innovation (Doblin, 2017). The Ten Types framework has received relatively little academic attention, and hardly any scholarly citations exist. Nevertheless, the framework is extensively used by practitioners like Schibsted, DnB, and Tine.

The Entrepreneur's Business Model

The Entrepreneur's Business Model is described as a six-component BM framework developed to be a flexible framework to characterize business models (Morris et al., 2005). The framework addresses three increasingly specific levels of decision-making. The first level is *foundation*, the second is *proprietary*, and the third is *rules*. The framework is supposed to help entrepreneurs to identify and ask critical questions as they move through the different decision-making levels. Contrary to the BMC and the Ten Types framework, Morris et al. (2005) include competitive strategy as one of the elements in the Business Model. By including competitive strategy, the framework reflects the need to align core competencies of the firm with a sustainable marketplace position (Morris et al., 2005; Fielt, 2013).

Chesbrough & Rosenbloom's Business Model

Chesbrough & Rosenbloom (2002) discuss the concept of Business Models in with a focus on technological innovation. According to the scholars, the business model is a construct that mediates between technology and economic value. In their framework, the business model takes technological abilities and potentials as inputs and converts them through customers and markets into economic output (Chesbrough & Rosenbloom, 2002). They also address competitive strategy as a separate element in their framework; however, they emphasize that their framework does not cover the full strategy of the firm (Fielt, 2013).

The 4I-framework of BMI

The 4I-framework of Business Model Innovation was developed by Frankenberger, Weiblen, Csik, and Gassmann (2013), as they believed the field lacked a comprehensive framework that supports the process of business model innovation. They claim that Business Model scholars need to take the process approach more into account for BMI. The 4I-framework's purpose is to accentuate the critical challenges that arise in their defined four phases of BMI: initiation, ideation, integration and implementation (the 4I's) (Frankenberger et al., 2013). Furthermore, Frankenberger et al. (2013) claim that most current BM frameworks mainly address the first two stages in the 4I model, the initiation and ideation stage (Frankenberger et al., 2013). Moreover, Frankenberger et al. (2013) argue that most business model innovations do not follow a sequential process through the 4I's, but rather iterate back and forth between the stages. In particular, they observed that iterations between integration and the implementation phase occurred regularly. For example, when the implementation of a new business model did not go as planned, the firm would iterate back to the integration phase and adjust the business model design (Frankenberger et al., 2013).

2.4 Business Model Canvas

2.4.1 Explaining the Business Model Canvas

The Business Model Canvas (BMC) is a Business Model framework that was developed by Alexander Osterwalder & Yves Pigneur (2010). The framework was inspired by design thinking and is presented as a shared language for describing, visualizing, assessing, and changing business models (Fielt, 2013). BMC is used by organizations such as IBM, Ericsson, Deloitte, and the Government Services of Canada (Osterwalder & Pigneur, 2010).

The BMC framework consists of nine building blocks that are mapped out as boxes on a canvas. The building blocks display the logic of how a company intends to create, deliver, and capture value (Osterwalder & Pigneur, 2010). We have illustrated the BMC in the figure below and explained each of the nine building blocks in the following paragraphs.

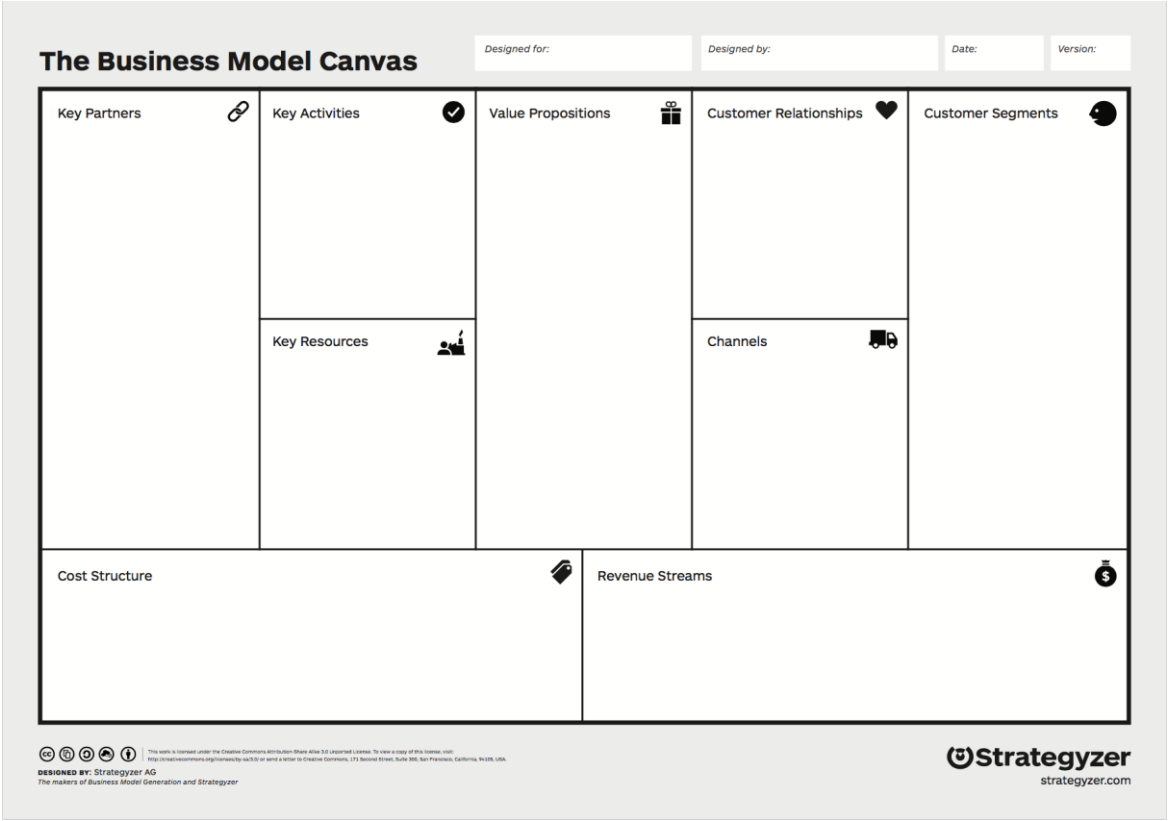

Figure 2.1: The Business Model Canvas (Strategyzer, 2018)

Customer Segments define the different groups of people or organizations a company aims to reach and serve. Without profitable customers the company cannot survive for long, an important question is thus "Who are the most valuable customers?". To satisfy the customer's needs, a company can group them into distinct segments with common needs and behaviors. Furthermore, the customers can be separated based on the distribution channel and type of customer relationship needed to serve them (Osterwalder & Pigneur, 2010).

Value Propositions describe the bundle of products and services that create value for a specific customer segment by solving a problem or satisfying a need. New value propositions can be made by catering to new needs, improving the performance, customizing the offer,

changing the brand, changing the price, reducing the risk, improving the accessibility or by increasing the usability (Osterwalder & Pigneur, 2010). The value proposition can either create gains or relieve pains by doing the customers "jobs to be done".

Channels describe how a company communicates with and reaches its customer segments to deliver a value proposition. Channels are customer touch points that play a critical role in the customer experience. Channels can be used for communication, distribution, or sales, and they can be owned by the company or a key partner. When deciding which channels to use the company should consider the cost, effectiveness, and integration potential. The channels should help raise awareness about the company and the value proposition. Moreover, the channels should help the customers to evaluate the value proposition, purchase specific products or services, deliver the value proposition to the customer, or provide post-purchase customer support (Osterwalder & Pigneur, 2010).

Customer Relationships describe the types of relationships a company establishes with its customer segments. We can distinguish between several categories of connections that can co-exist in a company's relationship with a particular customer segment. Examples of different relationships are personal assistance, self-service, automated services, user communities, and co-creation. Customer relationships can range from personal to automated and can be motivated by customer acquisition or retention. It is important that the company considers the cost and profit from the specific relationships, and their integration potential (Osterwalder & Pigneur, 2010).

Revenue Streams represent the income a company generates from each customer segment. The revenue streams may have different pricing mechanisms that are either fixed or dynamic. These mechanisms can be based on list prices, product features, customer segments, volume, negotiations, yield management or auctions. The company needs to ask how the customers prefer to pay, and how much each revenue stream contributes to the overall revenues. The revenue stream of a business model can involve transaction revenues or recurring revenues. Transaction revenues result from one-time customer payments while recurring revenues result from ongoing payments to deliver a value proposition or provide post-purchase customer support. Revenue streams can come from asset sales, usage fees, subscription fees, leasing, licensing, brokerage fees or advertising (Osterwalder & Pigneur, 2010).

Key Resources describe the most important assets required to make a business model work. These resources allow an enterprise to deliver the value proposition, reach markets, maintain relationships with customer segments, and earn revenues. Key resources can be physical, financial, intellectual, or human. Key resources can be owned, leased, or acquired from key partners (Osterwalder & Pigneur, 2010).

Key Activities describe the essential activities a company must perform to make its business model work. The value proposition, distribution channels, customer relationships and revenue streams all require specific activities to be completed. Key activities can be the production of the product or service, solving the customers' "jobs to be done", promotion and management of the company's platforms and networks (Osterwalder & Pigneur, 2010).

Key Partnerships describe the network of suppliers and partners that make the business model work. Companies create alliances to optimize their business models, reduce risk, or acquire resources. We can distinguish between four different types of partnerships: Strategic alliances, co-opetition, joint ventures, and buyer-supplier relationships to assure reliable supplies. The company must ask who the most important partners are, which key resources or activities that can be acquired from them, and what do they want in return. A company normally intends to engage in a partnership to get economies of scale by outsourcing or sharing infrastructure, reducing risk and uncertainty by forming strategic alliances, and acquiring access to particular resources or activities (Osterwalder & Pigneur, 2010).

Cost Structure describes all the costs incurred by operating a business model. When thinking about the cost structure, the company must consider what the most significant costs inherent in the business model are, and which key resources and activities are the most expensive. Strategically business models can be focused on delivering value or reducing cost. We can characterize cost structures as fixed costs, variable costs, economies of scale, and economies of scope (Osterwalder & Pigneur, 2010).

2.4.2 The relationships between the elements

The most useful feature of the BMC is the ability to describe the business logic of a company on only one page. To increase the understanding of this logic, Fritscher and Pigneur (2009) describe the nature of the relationships between the building blocks in the BMC. The

scholars divide the BMC into the four perspectives: *Activity*, *product/service*, *customer*, and *financial*. The relationships between the nine building blocks and the four perspectives can be seen from the figure below.

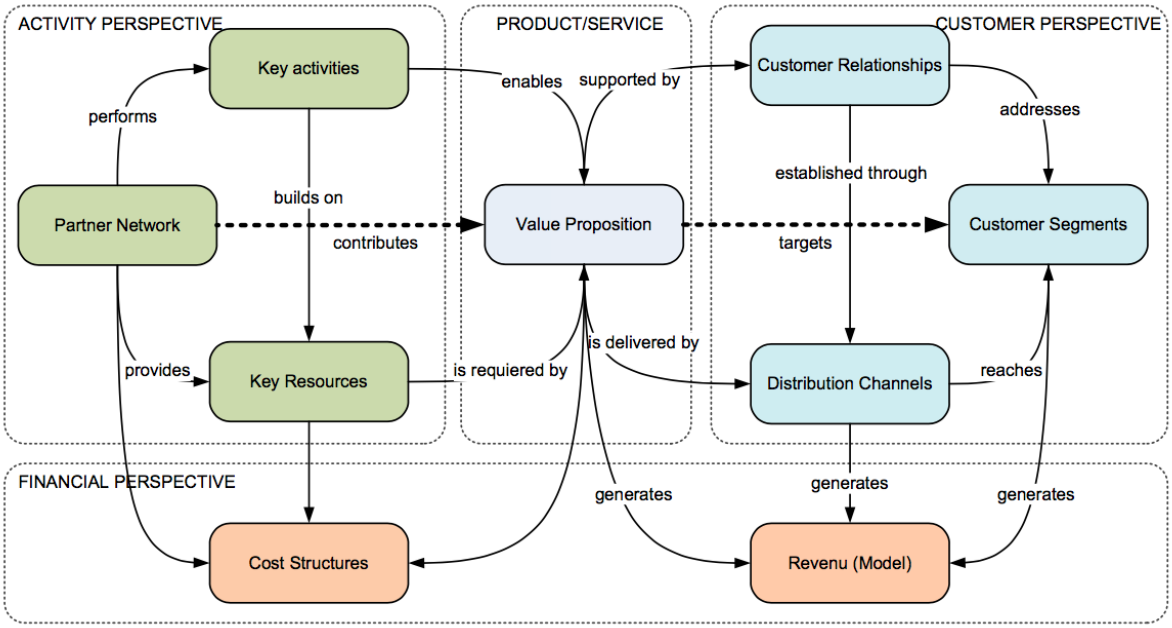

Figure 2.2 - Relationships and perspectives within the BMC (Fritscher & Pigneur, 2009)

From the figure we can see that the *activity* perspective focuses on how the value proposition is produced, whereas the *customer* perspective is concerned with how the value proposition is consumed. From the *product/service* perspective, the *financial* perspective is developed. The figure above shows how the BMC provides a holistic view of the BM, and illustrate how the elements within the BM are connected and dependent on each other (Frischer & Pigneur, 2010).

2.4.3 BMC as a tool for idea generation

We have chosen the BMC as the first framework for idea generation in our experiment, because of the popularity of the framework, its visual nature, focus on the value proposition, and because it has support from both practitioners and scholars. In the following two sections we will review how the BMC is supported by practitioners and scholars.

2.4.3.1 Support from practitioners

In Van der Pijl, Lokitz and Solomon's (2016) view, the Business Model Canvas can be an excellent idea generation tool if you know how to use it. The authors discuss four techniques that can be used to generate ideas with the BMC. These techniques are called freshwatching, removing the core, epicenters, and following patterns.

The *freshwatching technique* is about mixing and matching elements from different business models from other companies, that are often from other industries. An example of the *freshwatching technique* would be to ask the question "what if we operated with a business model like Amazon, Netflix or Spotify?". Hence, *freshwatching* is a way to look at the Business Model through the lens of other Business Models (Van der Pijl et al., 2016).

Removing the core involves removing the most central element that defines how the company creates, delivers, and captures value, and then to try to improve the BM without placing the core back. In practice, this can be done by using the BMC together with sticky notes. By trying to improve the BM without the core you will be forced to search for new ideas. For example, in the software industry the core would be the proprietary software that is developed and sold. The core will often be an activity or resource that is particularly important for the business (Van der Pijl et al., 2016).

Ideating by the use of *epicenters* involves using one of the nine building blocks as a focal point and then building the BM around that. The element that is selected to be the epicenter should be an important building block for the firm. When using the epicenter technique, the person innovating should ask what else your customer segment could want, or which other customer segments the value proposition could serve. Moreover, the innovator should ask what other ways the company could sell, lease, or rent the product/service, or what else the company could leverage their channels to do. Amazon used this technique when they figured out that they could use their cloud infrastructure to generate revenues in new ways (Van der Pijl et al., 2016).

When *following patterns* to innovate, you use known BM patterns and consider if they can be used in your business model to address a new customer need, create a new revenue stream, or innovate within the nine building blocks of the business model. An example of a BM pattern is the *multi-sided platform*, which entails that the BM services two customer

segments, where one customer segment uses the platform as a channel to exchange value with the other customer segment. An example of a multi-sided platform pattern can be seen in how Google makes money, by connecting advertisers and internet users through Adwords (Van der Pijl et al., 2016).

According to Garner (2015), BMC is often used as a new idea template to develop and submit new ideas. In particular, corporate incubators and accelerators are big fans of BMC as a tool for managing the ideas of different teams. Garner (2015) further explains that the canvas works as a shared language across business functions. In other words, it helps people from marketing, technology, engineering, operations, and finance to work together around a BMC template, giving them a shared language to discuss their ideas.

According to Azevedo (2017), BMC is a great tool to support ideation. Azevedo is a Product Management and Innovation consultant at Emergn, a digital business consultancy, and argues that "magic happens" when BMC is combined with the Ten Types of Innovation and powerful "what if" questions. Azevedo (2017) further states that if you use the two tools in combination, it improves ideation and generates innovation that is focused on the whole business model and not just in products and services.

2.4.3.2 Support from scholars

According to Joyce & Paquin (2016), the BMC is a popular and widely adopted tool for supporting BMI. Moreover, Fielt (2013) stated that BMC is the most well-known and widely used BM framework. Blank (2013) has supported this notion and writes that founders and entrepreneurs following the lean startup movement summarize and test their hypothesis by using BMC as a tool.

Wallin, Chirumalla, and Thompson (2013) stated that BMC is a promising tool to support, modify, or create new business models at a faster pace. Thus, the BMC can be considered a tool for corporate entrepreneurship. They argue that BMC is a visual tool that is easy to use for both individuals and groups, and that it covers different elements that have been identified as critical for successful business models. The authors further claim that the emphasis on the value proposition in BMC can help companies to take a mental break from focusing on their product.

According to Eppler, Hoffmann & Bresciani (2011), the BMC is specifically designed to generate new business models, and can serve as a tool in the idea generation phase of BMI. The researchers state that the visual template appears to improve collaboration in brainstorming sessions on complex and abstract tasks, such as generating new BM ideas. Eppler et al. (2011) found that when the BMC template was used for idea generation compared to a traditional idea generation setting, the template had both positive and negative effects on group processes. While the template significantly enhanced perceived collaboration, it significantly lowered both the perceived creativity and the willingness to adopt the innovation ideas generated from that ideation session. The authors mention that in future studies researchers should focus on comparing the perceived and objective creativity, together with the resulting quality of the ideas generated. This should be done to test if the perceptions correspond to the objective performance and if the creativity indeed will be reduced from using the BMC as a tool for idea generation.

2.5 Doblin's Ten Types of Innovation

2.5.1 Explaining Doblin's Ten Types of Innovation

The Ten Types of Innovations framework was developed by the consultancy firm Doblin which is a branch of Deloitte Development. The framework displays ten different types of innovation and can be used to diagnose and enrich own innovations or to analyze the innovations of competing firms. By using the framework you can reveal gaps and potential opportunities in the market (Keeley, Pikkel, Quinn & Walters, 2013). The framework serves as a checklist where you combine a set of innovations and then take several of them into your innovation work (Smelhus, 2016). We have illustrated Doblin's Ten Types of Innovations in the figure on the next page with the Ten Types of Innovation explained in the following paragraphs.

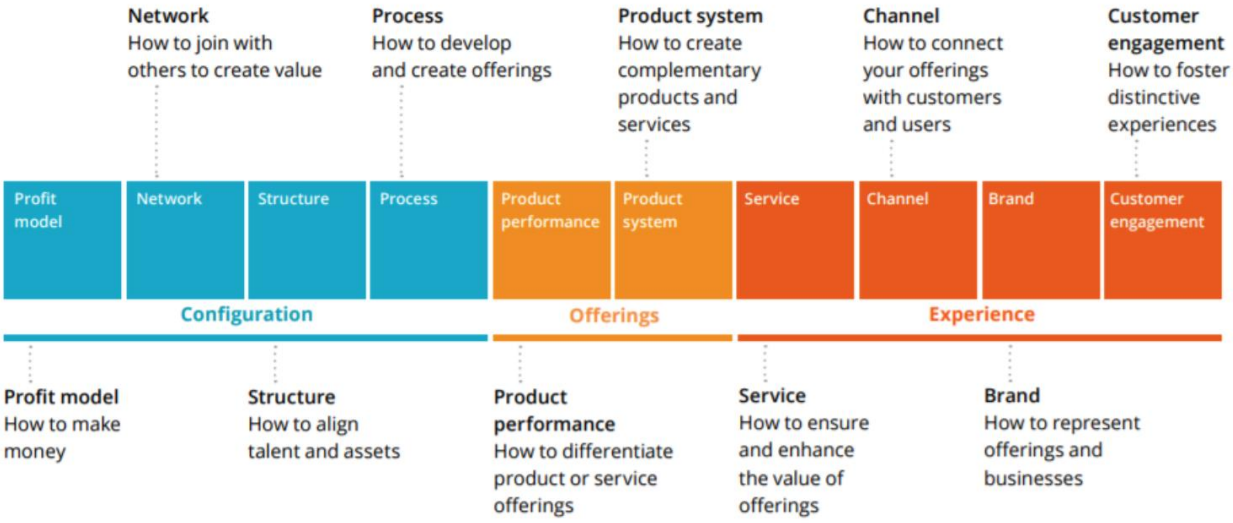

Figure 2.3 - Doblin's Ten Types of Innovation (Deloitte, 2018)

From the figure above, we can see that the innovations mainly fall into the three main innovation categories of configuration, offerings, and experience. Moreover, we can notice that the innovation types on the left side of the figure are less connected to the customer, while the innovations on the right side are very close to the customer.

Profit model innovation is about innovating the way the company makes money. Innovative profit models find a new way to convert a firm's offerings and other sources of value into revenue. Innovative profit models often challenge the assumptions in the industry regarding what to offer, charge, and how to collect revenues. The profit model innovation must be aligned with the company's overarching strategy. Examples of profit model innovations are premium prices, auctions, metered use, subscription, financing, float, and switchboard (Keeley et al., 2013).

Network innovation is about connecting with other market players to create new value together. New networks can provide a way for firms to take advantage of other companies' processes, technologies, offerings, channels, and brands. Network innovations help the company to share risk when developing new ventures. Examples of network innovations are prizes, crowdsourcing, secondary markets, franchising, collaboration, and supply chain integration (Keeley et al., 2013).

Structure innovation refers to how the company organizes and aligns talents and assets in unique ways that create value. An enterprise's corporate functions and fixed costs can be improved through structure innovation. Structure innovations can be particularly difficult to copy because they entail significant organizational changes or capital investments. Examples of structure innovation are incentive system, standardizing assets, corporate-educational systems, IT integration, and outsourcing (Keeley et al., 2013).

Process innovation is about innovating how the company performs their activities or processes and might involve a methodology or capability that is substantially different and superior from the industry norm. Process innovation requires that the company use unique capabilities, function effectively and adapt quickly. These innovations often include patents or a proprietary approach that yield advantages for years or even decades. Examples of process innovation are lean production, process standardization, predictive analytics, crowdsourcing, user-generated, and localization (Keeley et al., 2013).

Product performance innovation address the value, features, and quality of a company's offering, and involves both entirely new products as well as updates and line extensions that add value. Product performance innovation is often the easiest for competitors to copy. Common examples of product performance innovation include simplification, sustainability, conservation, safety, and customization (Keeley et al., 2013).

Product system innovation focuses on how to find complementary products and services which can be bundled together to create more value. The products could have ability to communicate together, be modular in design, and be integrated. Product system innovations help to build ecosystems that can capture and delight the customers and defend against competitors. Examples of product system innovations are: Product bundling, platforms, extensions to existing products, modular systems, and product service combinations with complementary offerings (Keeley et al., 2013).

Service innovation enhances the utility, performance, and perceived value of an offering by making products and services easier to try, use, and enjoy. These innovations fix problems and smooth rough patches in the customer journey, creating experiences that the customers come back for again and again. This type of innovation is increasingly delivered through electronic interfaces, remote communication, and automated technologies, however, human

beings are still a central part of service innovations'. Common examples of service innovation include product use enhancement, maintenance plans, customer support, information and education, try before you buy, warranties, guarantees, and loyalty programs (Keeley et al., 2013).

Channel innovation is about how the company connects and delivers their offerings to customers and users. The touch point of the offering exchange is the primary focus of channel innovations. Channel innovators often ensure that the users can buy what they want, when and how they want it, with minimal friction and cost. These innovations are particularly sensitive to industry context and customer habits. Examples of channel innovations are pop-up stores, selling directly through e-channels, experience center, context-specific and indirect distribution or multi-level marketing (Keeley et al., 2013).

Brand innovation is about how you represent your offerings and business, and help ensure that customers and users recognize, remember and prefer your offerings to those of competitors or substitutes. Brand innovations are often strategies that are implemented across many touchpoints between the customers and the company including communications, advertising, service interactions, channel environments, and employee and business partner management. Examples of brand innovations are brand extensions, brand leverage, certification, co-branding, transparency, values alignment, and private label (Keeley et al., 2013).

Customer engagement innovation focus on how to foster compelling interactions, by understanding the customers and users at a deeply profound level, and utilizing those insights to create meaningful connections between them and your company. Customer engagement innovations can help make the customers and users lives more memorable, fulfilling and even magical. Companies can create such innovations by for example using technology to deliver simplicity in incredibly complex areas, making life easier for customers. Other examples of customer engagement innovations are autonomy and authority, community and belonging, experience automation, experience enabling, mastery, personalization, status and recognition, and humanizing the offering (Keeley et al., 2013).

2.5.2 Doblin's Ten Types of Innovation as a tool for idea generation

We have chosen Doblin's Ten Types of Innovation (2013) as the second framework for ideation in our experiment. We have selected this framework because it has extensive support from numerous practitioners and is used by international and national companies in their innovation efforts. However, the framework has very little scholarly support, which combined with being extensively used by practitioners makes it particularly interesting for us to investigate in this thesis.

2.5.2.1 Support from practitioners

Doblin's innovation expertise is widely used by large companies. On their client list, we find companies like Adidas, American Express, Cemex, Scandinavian Airlines, Schibsted Media Group, Humana, Barclays Africa (Doblin, 2018). We have found that Doblin's Ten Types of Innovation framework is used by companies like Nofima (Hansen & Håbesland, 2010), the Norwegian nutrition corporation Tine (Norges Markedsanalyseforening, 2018), and the Norwegian bank DNB (Grimstad, 2018). Nofima is one of Europe's largest nourishment aimed research institutes and conducts research and development for the food industry (Nofima, 2018).

According to Tuff & Wunker (2014), innovators can increase their odds of success when innovating by using Ten Types of Innovation as a pattern recognition tool. The most successful innovations studied focus on shifts in the profit model and means of customer engagement. The best innovations combine six or more types of innovation, with at least one innovation type coming from configuration, offering, and experience (Tuff & Wunker, 2014). Keeley et al. (2013) goes even further in the support of the Ten Types and argue that when a market is mature and complex, it demands more sophisticated innovation that combines several types of innovation. The authors' further state that when five or more types of innovations are integrated with care, it is nearly always enough to reinvent a category and become newsworthy. Smelhus (2016) states that the framework works especially well as a checklist tool in a workshop process where the participants combine a set of innovations and then take several of them into their innovation work.

2.5.2.2 Support from scholars

According to Supphellen (2017), the Ten Types framework is used to systematically search for new opportunities to improve innovations by adding innovative elements. In a lecture on

commercialization of innovations at the Norwegian School of Economics, Supphellen illustrated that the framework helps to broaden the horizon and to avoid a myopic focus on the product. Supphellen (2017) further explained that in addition to innovating in the company, Ten Types can also be used to innovate upstream within supplier companies, or downstream with customer companies to increase the value in a network. In a similar vein, Kumar (2009) stated that the Ten Types of Innovation framework could help innovators move from a product innovation focus to a systematic combination of multiple innovation types. Furseth & Cuthbertson (2016) support the statements from Supphellen (2017) and Kumar (2009), and argue that the Ten Types framework is particularly beneficial when practitioners are trying to identify potential areas of innovation.

2.6 Creativity and idea generation

To compare the two BM frameworks in their suitability for ideation, we need insight from the creativity and ideation literature. Creativity is considered a crucial, although not sufficient, condition for innovation. Creative problem-solving depends on the effective execution of several complex cognitive processes. Because these processes can be analyzed, creativity can be systematically approached and trained (Mumford et al., 2012). According to Amabile, Conti, Coon, Lazenby, and Herron (1996) creativity is the seed of all innovation. Moreover, Doran & Ryan (2017) state that creativity is widely considered one of the critical and necessary ingredients of innovation. The successful implementation and commercialization of innovation depends on the initial innovation idea generated (Amabile et al., 1996). Miao and Wang (2015) assert that scholars often conceptualize innovation as a process that involves two distinct stages, the creative idea generation stage, or ideation stage, and the implementation stage. In this thesis, we focus on the ideation stage. Four of the dependent variables in our experiment are variables that measure sub-dimensions of creativity.

2.6.1 The creativity dimension of innovation ideas

According to Girotra, Terwiesch, and Ulrich (2010), virtually all innovation processes include generating and selecting opportunities or ideas. Most research papers in the area of idea generation and innovation management focus on the number of ideas generated, as opposed to the quality of the ideas. The researchers focus on quantity of ideas with the implicit assumption that more ideas will lead to better ideas. However, the success at the ideation stage in innovation usually depends on the quality of the best ideas generated. Most

innovators would prefer 99 bad ideas and one outstanding idea, instead of 100 decent ideas (Girotra et al., 2010). Consequently, the quality of the ideas is critical and should be operationalized and measured. By measuring the quality of the innovation ideas it is possible to identify and distinguish the best innovation ideas.

To be able to measure the quality of the innovation ideas we need to clarify what we mean by quality. Schuhmacher and Kuester (2012) specify that most researchers base their evaluation criteria of idea quality on Amabile's (1996) definition of creativity, which is "the production of novel and useful ideas in any domain" (p. 20). This indicates that researchers consider the quality of the innovation ideas to be the same as the creativity. To clarify the meaning of quality more profoundly, we need to study the creativity construct of innovation ideas.

Dean, Hender, Rodgers & Santanen (2006) reviewed 90 studies on creativity and idea generation, where they evaluated how the generated ideas were evaluated. They found that that creativity has often been defined as novelty, regularly including other quality attributes. The scholars propose a specific measure of creativity, where creativity is divided into quality and novelty. Quality is further conceptualized as a dimension consisting of workability, relevance, and specificity (Dean et al., 2006). By following this specific measure for creativity from Dean et al. (2006), we do understand that quality is not the same as creativity, rather it is a sub-dimension of creativity and we will follow this logic in this thesis. We also comprehend that it is not the quality of the idea that really matters, it is the creativity. Quality is just a sub-dimension of creativity, hence it only captures a small part of the big picture.

In the 90 studies examined, the scholars found that in 18 of the studies, ideas were only counted, and not evaluated in terms of creativity nor quality. In 21 of the studies, the scholars either used a single measure of creativity, or a single measure of quality, and no sub-dimensions were discussed. In the remaining 51 studies, one or more of the specific dimensions novelty, workability, relevance or specificity were explicitly measured (Dean et al., 2006). In these 51 studies, novelty was measured in 59 % of the studies, workability in 35 %, relevance in 69 %, and specificity in 10 %.

We have chosen to measure creativity as proposed by Dean et al. (2006), but since specificity was only used in 10 % of the studies we have excluded it from our measure. Dean et al. (2006) have specified two additional sub-dimensions for each of the four dimensions of creativity. The full creativity construct with the two sub-dimensions for each dimension can be seen from the figure below.

Creativity	Novelty	The degree to which an idea is original and modifies a paradigm		Originality	The degree to which the idea is not only rare but is also ingenious, imaginative, or surprising
				Paradigm relatedness	The degree to which an idea is paradigm preserving (PP) or paradigm modifying (PM). PM ideas are sometimes radical and tranformational
	Quality	Workability (Feasability)	An idea is workable if it can be easily implemented and does not violate known constraints	Acceptability	The degree to which the idea is socially, legally, or politically acceptable
				Implementability	The degree to which the idea can be easily implemented
		Relevance	The idea applies to the stated problem and will be effective at solving the problem	Applicability	The degree to which the idea clearly applies to the stated problem
				Effectiveness	The degree to which the idea will solve the problem
		Specificity	An idea is specific if it is clear and worked out in detail	Implicational explicitness	The degree to which there is a clear relationship between the recommended action and the expected outcome
				Completeness	The number of independent subcomponents into which the idea can be decomposed, and the breadt of coverage with regard to who, what, when, why, and how

Table 2.3: Creativity construct (Dean et al., 2006)

Because the focus in this master thesis is on *corporate entrepreneurship* not all the dimensions above are relevant. To measure creativity, we have chosen to focus on the sub-dimensions of *originality*, *implementability*, *applicability* and *effectiveness* in our experiment. We excluded *paradigm relatedness* and *acceptability* mostly because the innovation will occur within the organization and is not necessarily announced to the market. Thus, these dimensions are not always relevant for corporate entrepreneurs. We also excluded the dimensions under specificity, namely *implicational explicitness* and

completeness. The most important reason we excluded the specificity dimension is that it was only included in 10 % of the studies (Dean et al., 2006). However, the practical reason for excluding these variables is that the ideas produced in the experiment will be rated by a professional business developer at BTO. If the rater would have to rate the ideas on nine different dimensions the workload would increase significantly compared to the workload with four dimensions. In the figure below we present our creativity construct for this thesis adapted specifically for *corporate entrepreneurship*.

<table>
<tr><td rowspan="4">Creativity</td><td colspan="3">Novelty</td><td>Originality</td><td>The degree to which the idea is not only rare but is also ingenious, imaginative, or surprising</td></tr>
<tr><td rowspan="3">Quality</td><td rowspan="2">Workability</td><td rowspan="2">An idea is workable if it can be easily implemented and does not violate known constraints</td><td rowspan="2">Implementability</td><td rowspan="2">The degree to which the idea can be easily implemented</td></tr>
<tr></tr>
<tr><td rowspan="2">Relevance</td><td rowspan="2">The idea applies to the stated problem and will be effective at solving the problem</td><td>Applicability</td><td>The degree to which the idea clearly applies to the stated problem</td></tr>
<tr><td>Effectiveness</td><td>The degree to which the idea will solve the problem</td></tr>
</table>

Table 2.4 - Creativity construct for corporate entrepreneurship
(adapted from Dean et al., 2006)

2.6.2 The value dimension of innovation ideas

In the previous chapter, we have now discussed four selected creativity dimensions for innovation ideas that we consider to be particularly useful for *corporate entrepreneurship*. These four dimensions are used to guide managers on the different strengths and weaknesses of the innovation ideas, but how can the manager decide ideas which ideas to prioritize in the further innovation work? To measure the value of the ideas for the further innovation work we created a dependent variable that we call *priority*. The *priority* score of the innovation ideas shows how much the business developer would prioritize the innovation idea in the further innovation work to solve the specific challenge the company is facing.

The *priority* score becomes a variable summarizing the value of the innovation ideas and is our value dimension for the innovation ideas.

2.6.3 Methods for idea generation

Idea generation is a process closely linked with creativity and is defined as the "process of creating, delivering, and communicating ideas that are abstract, concrete or visual" (Businessdictionary, 2018). An idea is considered new if it is new to the firm. New ideas can either be completely new or they can be copied from the external environment (Doran & Ryan, 2017). Given the importance of creativity for innovation, organizations should have strong incentives to take action to stimulate the individual creativity of employees through the use of ideation methods. There exist several methods that can be used for ideation. An important choice we had to make for our thesis was to decide which ideation method to use when conducting the experiment. In the following two sections we will discuss two popular ways to stimulate employee creativity that we have considered for our experiment. We include the theory because managers should consider these methods for their ideation sessions.

Brainstorming

Brainstorming is a popular ideation method, which is centered around teams and often initiated by a leader. In brainstorming each team member is given the task to generate several ideas of relevance to the decision problem. The purpose of brainstorming is to let individual's ideas stimulate each other and lead to a chain reaction of new ideas. The ideas presented does not need to be explained or defended, nor should the ideas be judged or analyzed before the meeting ends. The leader should then give each idea equal consideration, and the best ideas should be selected for further analysis. A critique to the brainstorming method is that its success is highly sensitive to the experience and skill of the leader.

Brainwriting

Similar to brainstorming, we have brainwriting, which is a form of sharing of written ideas in groups as a means to enhance creativity (Paulus & Yang, 2000). In this method, the participants write their ideas down, without discussing them with other participants. The leader then plots all the ideas generated on a board for everyone to see, in an idea exchange process, or *incubation* (Selart, 2010; Paulus & Yang, 2000). For the participants, the purpose is then to build on the initial ideas or add new ideas inspired by the initial ones. Then, in a

later meeting, the evaluation of the ideas takes place (Selart, 2010). Brainwriting is particularly useful when working in larger groups, as writing down the ideas allows all participants to present their ideas and prevents production blocking (Sverdrup & Schei; Paulus & Yang, 2000). In the following chapter, we will elaborate on why we decided not to use brainstorming or brainwriting as ideation methods in our experiment.

2.6.4 Individual creativity vs creativity in teams

Teams are commonly used to develop creative ideas in the professional world, and both the brainstorming and brainwriting methods are often conducted in teams. However, some scholars have found that teams tend to be less creative than individuals (Sverdrup & Schei, 2011). The scholars argue that traditional brainstorming in teams often is inefficient as a method for ideation because several group dynamics hinder individual performances. These group dynamics occur when the individuals seek group-conformity which make them more unwilling to present their ideas. Furthermore, large groups can lead to a phenomenon called production blocking, which entails that individuals in a group block each other's ideas by presenting their ideas because they disturb the thought process of the others. Effective management of the ideation process and conscious design of the team can help overcome group-conformity and production blocking.

An alternative to group ideation that removes the issues of group-conformity and production blocking is individual ideation (Sverdrup & Schei, 2011). To avoid the potential group biases from affecting the results of the experiment we will conduct in this thesis, we will use individual ideation. The practical consideration of our choice is that we would need at least twice the number of participants to conduct the experiment with teams and get results with statistical validity.

2.6.5 Comparing BMC and Ten Types as ideation tools

In this part, we will compare the Business Model Canvas and Ten Types of Innovation as tools to systematically generate innovation ideas. First, we will look at the different elements and relationships in the two frameworks. Second, we will consider the similarities between the frameworks and discuss potential synergy effects from combining them in ideation sessions.

2.6.5.1 Elements and relationships

The frameworks differ in the type of elements included, how they are related, and how the frameworks are used to generate ideas. Consequently, the frameworks are different in their inherent strengths and weaknesses for idea generation. The BMC consist of nine elements describing different functions in a BM, while the Ten Types framework has ten elements describing the ten different types of innovation. The relationships between the elements are visualized clearly in the BMC, and the framework illustrates how a Business Model is constructed of several building blocks that must function together for the BM to work. As a result, the BMC is excellent for providing a holistic understanding of how a specific Business Model works.

In the Ten Types framework, the relationship between the elements are not organized as a Business Model, and the relationship between the elements are not shown. Therefore, we suggest that the Ten Types framework does not stimulate a holistic understanding of a BM. On the other hand, the Ten Types framework leads the user to focus on one distinct innovation type at a time, allowing a stronger focus on each innovation type. Whereas the BMC aids the user in considering the entire BM, the Ten Types framework helps the user to focus on the ten different innovation types mindless of the fit in the current BM.

We propose that the BMC could help innovators to generate innovation ideas that are based on the current business model, while the Ten Types gives the innovator more freedom to come up with ideas that are not attached to the current BM. A result of this difference could be that the BMC users will generate innovation ideas that have a higher *implementability*, but lower *originality*, while the users of the Ten Types framework will generate ideas that are less *implementable*, but more *original*.

From Chesbrough (2010), we know that one of the barriers to BMI is often the dominant logic of the current Business Model that is making it hard to come up with novel, or in other words, *original* innovation ideas. We suggest that the Ten Types framework can serve to overcome this barrier.

2.6.5.2 Similarities and synergy effects

We have looked at the similarities between the BMC and the Ten Types of innovation and found that the ten innovation types from the Ten Types framework can be mapped within

the BMC. To illustrate how the frameworks fit together we have mapped the ten innovation types within the BMC in the figure below.

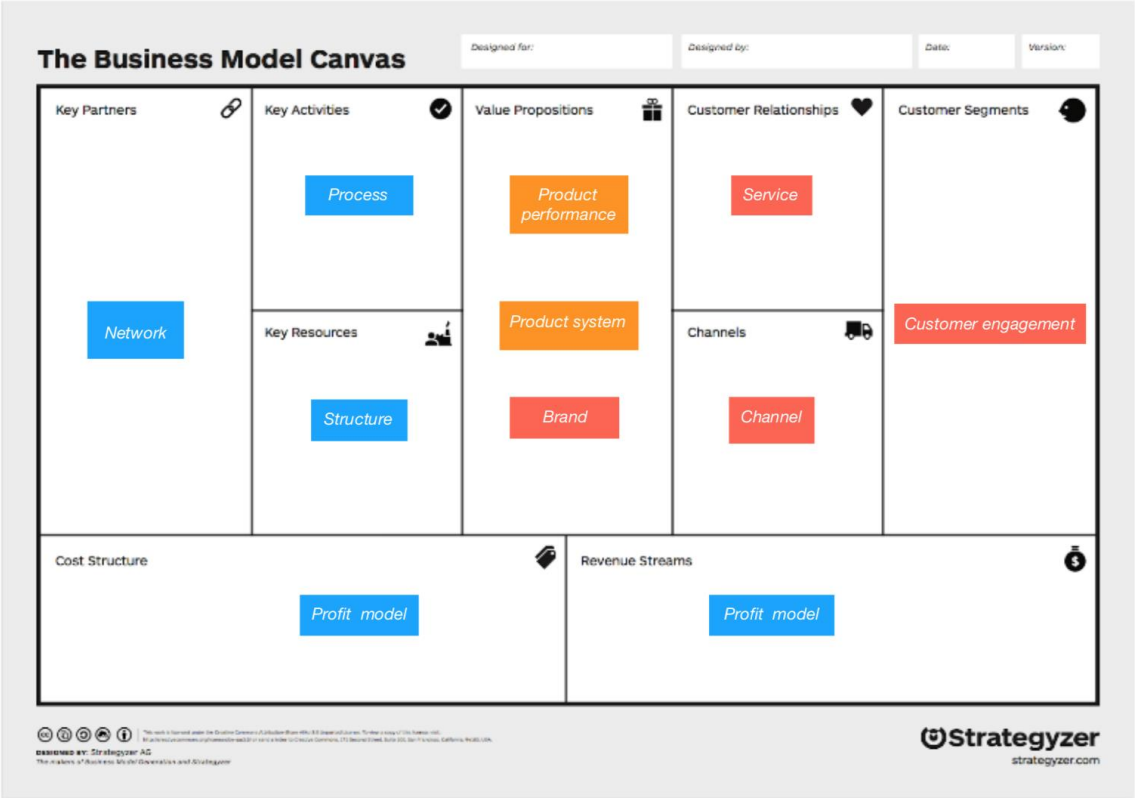

Figure 2.4: Ten Types mapped within the BMC (Adapted from: Strategyzer, 2018)

Profit model innovation was the only innovation type we mapped into two different building blocks because the profit model of a company is dependent on both the revenue streams and the cost structure. We have used the color coding from the Ten Types of Innovation framework to code the main innovation categories for the ten innovation types. The blue innovation types are configuration, the orange offering, and the red experience. In a similar way as for the Ten Types framework, the innovation types on the left side of the figure are less connected to the customer, while the innovations on the right side are close to the customer.

According to Azevedo (2017), the best ideation results come when the BMC is combined with the Ten Types of Innovation and "what if" questions. We support Azevedo (2017) on combining the two frameworks and suggest that if companies use the innovation tactics from the Ten Types of Innovation within the building blocks of the BMC, they can experience synergy effects and increase the quality of their BMI. Moreover, we suggest that innovators

use the BMC first to map out their Business Model and where the problem is located, and then find the right innovation type from our map so that they can ideate for new innovation ideas using the innovation tactics from the Ten Types framework provided in appendix 11.2.3. The Ten Types framework can free innovators from the current BM, and help them to generate new and more *original* innovation ideas, detached from the current Business Model. To help managers chose between the two frameworks, we have summarized the differences between the frameworks in the table below.

Dimension	BMC	Ten Types of Innovation
Framework design	One-page canvas, made out of nine building blocks representing complete business model for a company	One-page framework displaying ten different innovation types. The first four types are about the business' configuration, the next two types are about the offering, and the last four types are about the customer experience
Core purpose	Provide a holistic representation of the BM. Focus on linkages between elements	Work as a disciplined and systematic approach to innovation. Focus on the diversity of ways to innovate
Key advantage	Visual, intuitive, and easy-to-use. Stimulates high *implementability* in innovation ideas	Intuitive and easy to use, broadens the innovation focus and stimulates high *originality* in innovation ideas
Key disadvantage	The focus on the current BM can reduce *originality* of the new ideas generated.	Since there is no focus on the relationships between the innovation types and the current business model, the framework is weak in creating ideas that are *implementable* in the current BM
Suitability for individual ideation	High	High
Suitability for team ideation	High, as the canvas illustrates the relationships between the elements and their relation to the current BM and facilitates communication	Medium, as the Ten Types does not display the relation between the elements and the relation to the current BM. The framework can facilitate discussion but not to the extent that the BMC achieve
Suitability for Corporate Entrepreneurship	High	High
Suitability for Entrepreneurship	High	High

Table 2.5: Comparison of the BMC and Ten Types of Innovation

3 Hypotheses

In this chapter we have developed nine research hypotheses that will be tested in our experiment. The hypotheses are based on the theoretical foundation from the literature review and represent the expected effects the manipulation in the independent variable will have on the dependent variable. In the following subchapters we will first develop hypotheses on the quantity of innovation ideas. Second, we will develop hypotheses on the creativity of the innovation ideas. Finally, we will develop hypotheses on the relative strengths of the frameworks compared to each other. In the development of the hypotheses, the two treatment groups with frameworks are compared to the control group without a framework.

3.1 Quantity of ideas

Most empirical studies in the area of idea generation and innovation management focus on the *number* of ideas generated, as opposed to the quality of the ideas. The rationale behind this focus is that more ideas will lead to better ideas (Girotra et al., 2010). Following this vein of logic, we developed the first three hypotheses to find out which of the groups produce the highest quantity of ideas.

3.1.1 Expectations for BMC

From the literature review we know that the BMC is often used as a template to develop new ideas, and that the BMC can serve as a shared language for describing, visualizing, assessing and changing business models (Garner, 2015; Fielt, 2013). According to several practitioners the BMC is an excellent tool for idea generation (Van der Pijl et al., 2016; Azevedo, 2017). Various researchers have argued that the BMC can support the modification and creation of new Business Models at a higher pace, underscoring that the framework is specifically designed to generate new business models (Wallin et al., 2013; Eppler et al., 2011).

The literature reviewed so far is clearly in favor of the BMC group producing more business ideas than the control group. However, we must take into account that all the participants in our experiment had exactly 20 minutes to read and finish the experiment. The free ideation group could have more time available for ideation. This could in turn cause a positive effect

on the number of ideas produced by the control group. Furthermore, there is a possibility that the frameworks have a restraining effect on the ideation process. The participants using BM frameworks might then feel they can only generate ideas within the rigid scope of the framework, and as a consequence they produce less ideas. Taking the previous mentioned possibilities into account, we expect the positive effect from using the BMC to overshadow the negative effect. Thus, we hypothesize that the BMC group will produce a higher quantity of ideas than the free ideation group.

H1: The group using the BMC framework will generate significantly more ideas than the free ideation group in a 20 minute ideation session.

3.1.2 Expectations for Ten Types

From the literature review we know that the Ten Types framework is particularly useful for practitioners to systematically identify new areas of innovation, improve innovations, and combine multiple innovation types (Supphellen, 2017; Kumar, 2009; Furseth & Cuthbertson, 2016). According to Tuff & Wunker (2014), innovators can increase their odds of success when innovating by using the Ten Types as an innovation tool. Smelhus (2016) suggest that the Ten Types framework works especially well as a checklist tool in a workshop process where the participants combine a set of innovations.

Based on the research discussed in the previous paragraph, it is reasonable to expect that the group with the Ten Types framework will produce a higher quantity of ideas than the free ideation group. However, the same counter-arguments that we discussed for the BMC applies here. To recap, the participants might spend much time on getting to know the framework, and might feel restricted to follow the mental frames set by the tool, thus limiting the amount of ideas they produce. Regardless, we argue that the net effect on the quantity of ideas from using the Ten Types is positive. Therefore, we hypothesize that the the group with the Ten Types framework will produce a higher quantity of ideas than the free ideation group.

H2: The group using the Ten Types framework will generate significantly more ideas than the free ideation group in a 20 minute ideation session.

3.1.3 Relative quantity

Building on research from the literature review we expect that the Ten Types framework will generate a higher quantity of ideas than the BMC framework. We propose that the BMC framework can be experienced as rather open and without exact suggestions for how to initiate the ideation process. As a consequence, some participants might generate less ideas while using the BMC. On the other hand, the Ten Types framework comes with a list of 110 innovations within the ten different innovation types and is more suggestive in its nature. As a result, the participants are able to combine and pick ideas from the innovation list and it is likely that they will produce more ideas than with the BMC framework. Thus, we hypothesize that the Ten Types group will generate a higher quantity of ideas than the BMC group.

H3: The group using the Ten Types framework will generate significantly more ideas than the group using the BMC in a 20 minute ideation session.

3.2 Creativity of ideas

3.2.1 Expectations for measured creativity

To answer our research question, our most essential hypotheses are those concerning the expected effects on creativity. We defined creativity in chapter 2.6.1 and have made use of the definition from Dean et al. (2006). Because we have focused on corporate entrepreneurship in this thesis, some parts of the creativity definition did not apply. We found it meaningful to measure the novelty aspect of creativity through the sub-dimension of originality, and the quality aspect through the sub-dimensions of implementability, applicability, and effectiveness. As an additional measure to estimate the value of the idea, we added a dimension for the priority of the innovation idea, where the expert panel had to rate how much they would prioritize the innovation idea in the future innovation work.

To this date, no scholars have tested the BMC and Ten Types frameworks in their ability to facilitate ideation while measuring the creativity of the output. As argued by Girotra et al. (2010), most empirical studies in the area of idea generation and innovation management focus on the number of ideas generated, with the assumption that more ideas will lead to a larger selection of great ideas. In the literature review we have shown that the BMC and Ten Types frameworks have received significant support from scholars and practitioners as tools specifically suited for supporting idea generation. Both frameworks are currently being used

by numerous companies around the world in their innovation efforts, yet the frameworks have not been empirically tested in their effect on the innovation ideas produced.

Based on the findings from our literature review, we expect that the creativity of the ideas generated by the treatment groups using the BMC and Ten Types frameworks, to be higher than the creativity of the ideas from the free ideation group. Consequently, we hypothesize that both frameworks will generate ideas that are *more* creative compared to the free ideation control group.

H4: Using BMC as a tool for ideation has a significant positive effect on the (a) Originality, (b) Implementability, c) Applicability, (d) Effectiveness, and (e) Priority of the innovation ideas generated, compared to using free ideation.

H5: Using Ten Types as a tool for ideation has a significant positive effect on the (a) Originality, (b) Implementability, c) Applicability, (d) Effectiveness, and (e) Priority of the innovation ideas generated, compared to using free ideation.

3.2.2 Expectations for perceived creativity

Eppler et al. (2011) tested the perceived creativity, perceived collaboration, and willingness to adopt the innovation ideas generated from an ideation session, with the BMC as an ideation tool. The empirical data from Eppler's experiment showed that when the teams used BMC for ideation, the perceived collaboration increased, while at the same time the perceived creativity and willingness to adopt the innovation idea decreased. Eppler et al. (2011) explained the decrease in perceived creativity to be caused by the rather fixed structure of the template. The scholars argue that the teams that used the BMC for ideation were relatively fixed and forced to think within the given domains of the template.

Because we have no teamwork involved in our experiment, we can not measure collaboration. Moreover, we reckon that the decision to adopt an innovation is a team decision and assume that the willingness to adopt innovations is strongly affected by psychological processes within the team. To extend the research from Eppler et al. (2011), we decided to measure the individual participants' perceived creativity. Due to the relatively fixed and forced way of thinking within both frameworks, we expect the perceived creativity to decrease for both treatment groups compared to the free ideation control group.

Consequently, we hypothesize that the perceived creativity will decrease for both treatment groups compared to the free ideation group.

H6: Using the BMC as a tool for ideation will decrease the perceived creativity compared to the free ideation group.

H7: Using the Ten Types as a tool for ideation will decrease perceived creativity compared to the free ideation group.

3.2.3 Relative strengths and weaknesses

When corporate entrepreneurs decide which framework to use for their innovation efforts, it is critical that they know the inherent strengths and weaknesses of the frameworks. The inherent strengths and weaknesses of the frameworks depend on how they are different from each other.

The frameworks differ in the type of elements included, how they are related, and how the frameworks are used to generate ideas. Consequently, the frameworks are different in their inherent strengths and weaknesses for idea generation. The relationships between the elements are visualized clearly in the BMC, and the framework illustrates how a Business Model is constructed of several building blocks that must function together for the BM to work. As a result, the BMC is excellent for providing a holistic understanding of how a specific Business Model works.

In the Ten Types framework, the relationship between the elements are not organized as a Business Model, and the relationship between the elements are not shown. Therefore we suggest that the Ten Types framework does not stimulate a holistic understanding of a BM. On the other hand, the Ten Types framework leads the user to focus on one distinct innovation type at a time, allowing a stronger focus on each innovation type. Whereas the BMC aids the user in considering the entire BM, the Ten Types framework helps the user to focus on the ten different innovation types mindless of the fit in the current BM.

We propose that the holistic view of the BMC helps innovators generate innovation ideas that take the current BM into account and builds on it, while the Ten Types of innovation stimulates the creation of ideas that are less attached to the current BM. Consequently, we

hypothesize that the BMC group will produce innovation ideas with a higher *implementability* and lower *originality*, than the Ten Types group, and vice versa.

H8: Using BMC as a tool for ideation leads to innovation ideas with higher implementability compared to the Ten Types framework.

H9: Using Ten Types as a tool for ideation leads to innovation ideas with higher originality compared to the BMC framework.

4 Research model

We have developed a research model for the experiment based on our research question in chapter 1.1, and the hypotheses from chapter 3. The research model is illustrated in figure 4.1 and shows the variables and relationships we will study in our experiment.

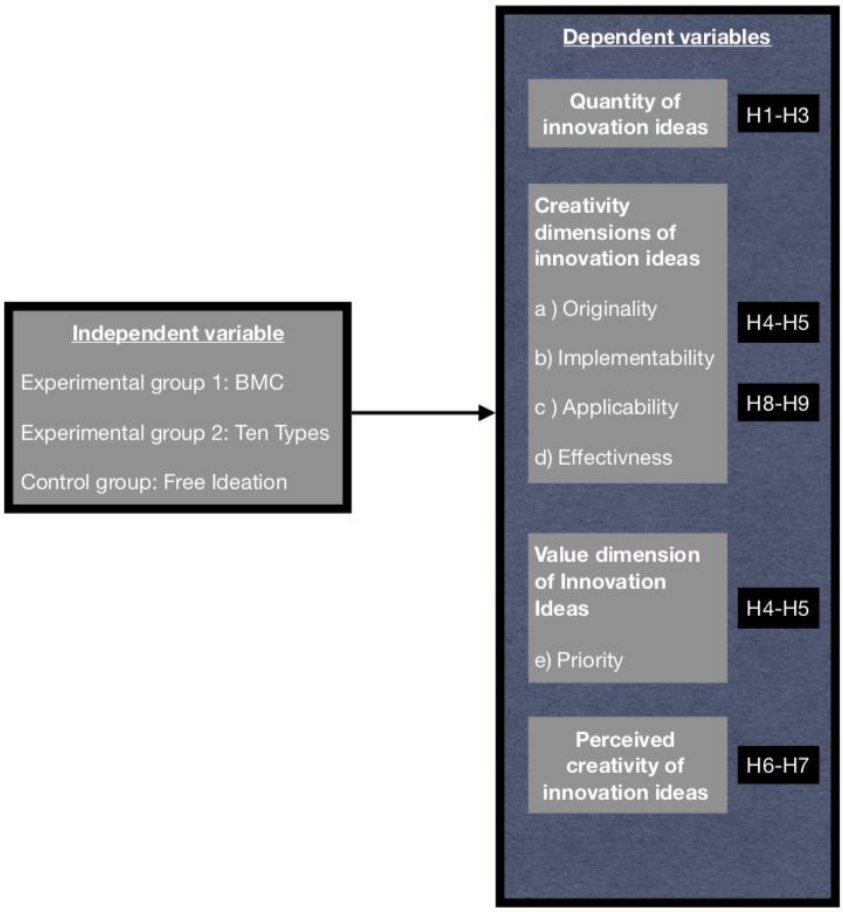

Figure 4.1: Research model

From the research model we can see the independent variable on the left side which will be operationalized by randomizing participants into three equally large groups. On the right side we see the various dependent variables explained in the grey boxes, with the hypothesis in the black boxes. Our research model focuses on the quantity, creativity, and value of the innovation ideas produced during the experiment scenario. In addition to measuring the actual creativity, we also measure the perceived creativity by the participant. By checking the perceived creativity, we can see if the perceptions are aligned with reality.

5 Research design

The research design is the general plan for how to answer the research question, and will guide how to collect and analyze the data used in the research (Iacobucci & Churchill, 2010; Johannessen et al., 2011; Saunders et al., 2016). Moreover, the research design will discuss the potential challenges the researcher will encounter (Saunders et al., 2016).

5.1 Purpose of research

Several scholars have identified a research gap in the literature on Business Models and BMI, claiming that the literature is mostly conceptual, and that it lacks empirical evidence (Foss & Saebi, 2017; Fielt, 2013). The purpose of our research is to address the research gap by producing empirical evidence on the effects of using two different BM frameworks for idea generation. We will measure how the use of the BMC and the Ten Types as ideation tools, affect the creativity of the ideas generated to solve a business case. The research question we search to answer is:

What is the effect of using the Business Model Canvas and Doblin's Ten Types of Innovation as idea generation tools on the quantity, creativity, and value of innovation ideas produced to solve a business case?

Since we attempt to prove a causal relationship between variables, our research is categorized as explanatory. The emphasis in explanatory research is to study a situation or a problem in order to explain the relationship between variables (Saunders et al., 2016).

5.2 Research approach

According to Saunders et al. (2016), the choice of research design depends on the purpose of the research, as well as how much research on the topic currently exists. Because the purpose of our study is explanatory, and there exist large amounts of conceptual research on the topic of BMI, we have chosen a quantitative research approach. A quantitative approach is suitable for research with an explanatory purpose because it examines relationships between variables, which are measured numerically and analyzed using a range of statistical and graphical techniques. Quantitative research often incorporates controls to ensure the validity of data, for example through an experimental design (Saunders et al., 2016).

5.2.1 Deductive theory development

The theory development in our thesis uses a deductive reasoning approach. This implies that we have developed the theory from the general to the specific, by creating conclusions that are based on existing theory, in order to make hypotheses that can be verified or falsified to empirically test the conclusions (Gill & johnson, 2010; Saunders et al., 2016). We started our deductive theory development by discovering and reading the relevant academic literature. Then, we developed a theory from the arguments in the academic literature. Next, we identified and operationalized the variables connected to our theory and produced testable hypotheses. Finally, we collected data through our experiment in order to falsify or verify the hypotheses for our theory.

5.2.2 Time horizon

The time horizon of our research design is cross-sectional, meaning that we study a particular phenomenon at a particular time (Saunders et al., 2016). We have chosen a cross-sectional time horizon for our study, because we have limited time and budget to complete our research. Moreover, our study is an extension of the current scientific research, thus we cannot perform a longitudinal study looking backwards in time. By using a cross-sectional time horizon for our study, we are able to collect large amounts of data in a cost and time effective way.

5.3 Experimental research strategy

A research strategy can be defined as a plan for how a researcher will go about answering the research question (Saunders et al., 2016). We have chosen an experimental research strategy with a between-subjects design to answer our research question. Experimental studies are usually considered to be more effective than non-experimental designs in uncovering causal relationships among variables. This is due to the fact that through control and randomization, potential confounding effects can be removed from a study (Spector, 1993).

5.3.1 Between-subjects two-factor posttest control group design

We have chosen a between-groups approach for our experiment, which is also known as a multiple group approach. This means that with a minimum of two groups, the participants in each group will only be exposed to one level of the independent variable, with no crossover between conditions. Two advantages with a between subjects approach, is that it

allows the researcher to randomly assign participants to different conditions, and allows the researcher to compare the different treatments (Edmonds & Kennedy, 2017). In this thesis, the between-subjects approach follows a two-group posttest-only control group design. This entails that we have two treatment groups and one control group with a posttest only, that is, no pretest (Edmonds & Kennedy, 2017).

By using a posttest-only control group design we can control for several sources of internal invalidity. The intrinsic factors are controlled for as the groups are exposed to the same external events, and undergo the same *maturation* processes. In addition, the extrinsic factor of selection is controlled by the random assignment of individuals, which prevents an initial bias in either group (Frankfort-Nachmias & Nachmias, 2008).

5.3.2 True experiment

The experiment type that we have chosen is a true experiment. This type of experiment is often called a classical experiment or a lab experiment and should be distinguished from a quasi-experiment. In a true experiment the relevant behavior of interest is *not* observed in its natural everyday setting. Rather, it is observed under constructed laboratory conditions, where the researcher can exert a great deal of control and manipulate the relevant variables.

There are three conditions that have to be met in order to test the hypotheses through a true experiment (Gill & Johnson, 2010). First, the researcher has to be able to manipulate the occurrence and nonoccurrence of the independent variable through a direct intervention. Second, the researcher must be able to identify and measure any subsequent changes in the dependent variable. Third, the researcher must be able to control for the effects of any extraneous and potentially moderating variables upon the dependent variable such as age, gender, and relevant experience. To meet the first condition, we manipulate the occurrence and nonoccurrence of our independent variables through matching the participants to one of the two treatment groups or the control group by random assignment. To meet the second condition, we measure the change in the dependent variables through the data collection from the experiment. To meet the third condition, we use a survey after the experiment to capture and control for potential moderating variables.

A critical part of the true experiment is the matching of the experiment groups. The process of matching the treatment and control groups prior to any treatment is vital in the control of

extraneous variables, and allows for confidence regarding the internal validity of the following findings. We have used randomization, which is a commonly used technique for matching in an experiment. The subjects in our study were randomly assigned to control and experimental groups, thus the extraneous variables should be equally distributed among the groups. The randomization mechanism we used, was that the first participant would be placed in the BMC group, the second in the Ten Types groups, and the third in the control group. This mechanism ensured that the group sizes would be within one participant in size of each other. Our assumption is that all variables, except the independent variable, will be randomly distributed, hence the characteristics of the control and experimental groups will be equivalent on average, and consequently they are comparable (Gill & Johnson, 2010).

5.3.3 Groups and manipulations

Our experiment had two treatment groups and one control group. The treatment groups were exposed to either the BMC or Ten Types of Innovation while the control group was not exposed to any BM framework. Exposing the treatment groups to a BM framework is the manipulation that we expect to see an effect in the dependent variables from. All groups was given the same innovation case to answer. This was a fictive case from the salmon industry, which will be presented in chapter 5.8.4. Furthermore, the treatment groups received instructions on how to use the frameworks to generate ideas most efficiently. The control group only used free ideation and received no additional information on how to answer the case. The ideas generated by all the groups will be compared in the analysis.

5.4 Individual ideation

In our experiment, the frameworks was tested using individuals, where we test the creativity of the ideas generated. We have earlier discussed several unfortunate group dynamics, like participants' seek for conformity and production blocking, that can hinder individual performances in an unstructured group ideation session. Thus, traditional brainstorming and brainwriting can be inefficient as approaches to ideation (Sverdrup & Schei, 2011). Consequently, we used individual ideation in this experiment to overcome these group biases.

5.5 Post-experiment survey

In order to establish a cause-effect relationship between our independent and dependent variables, we needed to isolate the cause. We used a post-experiment survey to measure

potential moderating variables. In the survey we measured the number of ideas, experience with generating ideas, experience with the BMC and Ten Types, perceived difficulty, perceived creativity, perceived value, year of study, and age of the participants. We also asked the participants what they believed the purpose of the study was to see if they had any expectations about the desired outcome from the experiment. The post-experiment survey is provided in appendix 11.2.5.

5.6 Practical details of the experiment

The experiment was conducted on the NHH Campus in Bergen over a time period of three weeks in the afternoons. In the experiment we let NHH students using BMC or Ten Types as ideation tools generate innovation ideas to answer a fictive case. We decided to let them answer the case on a physical paper, that required the participant's physical attendance, as opposed to a digital experiment using a survey software. We did this as we believed a physical experiment where the participants had the opportunity to make notes and sketch within the BMC and the Ten Types framework, would stimulate their creativity to a larger extent, and make it easier to generate ideas.

5.6.1 Length of experiment process

We decided to let the participants use no more than 20 minutes to read the case, and write down their ideas. The time used to answer the post-experiment survey was not included in these 20 minutes. Although we estimated that most participants would need at least 20 minutes to answer to case, and probably longer, we decided to put this time limit on the experiment. This is because it is more likely that potential participants are willing to participate when informed that the experiment lasts 20 minutes, rather than 30 minutes or longer. Limitations caused by this time limit will be discussed in chapter 8. Furthermore, we referred to the experiment as a survey, rather than an experiment, when recruiting participants. This was to remove mental barriers some people might have towards participating in an experiment, whereas we believed that using the word survey would seem less intimidating.

5.6.2 Incentivization

In order to reach enough participants, how to incentivize experiment participation was an important concern. If 20 minutes of the participants' time seemed like a big effort, we could experience a relatively low participation rate if we did not incentivize correctly. We decided

to incentivize participation with waffles and lottery tickets. Each participant would receive one waffle, including toppings, and a lottery ticket with chance of winning 10 000 NOK.

5.6.3 Procedure

When initiating the experiment, all participants received one of three information handouts, which put them in one of the treatment groups, or the control group. All necessary information about the case, the frameworks, and boxes to write down their ideas, were provided in these information handouts, see appendix 11.2.2-11.2.4. Participants were usually put together in groups of 2-4 in a group room that we monitored, but instructed not to cooperate or discuss with each other. First, all participants read the case information, that should be studied and interpreted, as well as a task they were asked to answer on behalf of the fictive case company. Then, the two treatment groups received the BM frameworks, as well as brief instructions on how to use the frameworks most efficiently, while the control group skipped this stage. The treatment groups was asked explicitly to use the BM frameworks as a tool to generate ideas and answer the case, while the control group received no additional information on how to answer the case. The purpose of exposing the treatment groups to the case before being exposed to the frameworks, is to allow them to keep the framework fresh in mind when analyzing the case. Lastly, the participants were asked to write down as many ideas as possible, in the 16 boxes provided in the handout. We wished to stimulate a focus on many ideas, in order to get a high quantity of ideas for our analysis. After the participants answered the case by submitting their ideas, the experiment part finished. The participants then answered the short survey, and submitted their handouts to us.

5.6.4 Experiment scenario

The scenario given in the experiment is a business case about the fictive salmon producer company Real Salmon ASA. The salmon producer is located in Øygarden outside of Bergen and produces salmon for the international market. Their selling price is determined by the spot price in the market. The participants are given a graph that shows decreasing salmon prices in 2017, as well as projected increasing production costs in 2018. As a consequence, Real Salmon's profitability suffers large fluctuations, and is likely to drop to unprofitable levels during 2018.

After studying the case, the participants were instructed to enter the role of an external innovation consultant that has been hired by Real Salmon to help them with their profitability challenges. Their job is to generate innovative ideas that can help the company drive future profitability, even when the company face lower salmon prices and higher production costs. The participants were asked to generate innovation ideas relevant for Real Salmon, given the information and facts received in the scenario. The complete scenario text is in appendix 11.2.1.

5.7 Data and measures

5.7.1 Type of data

The data collected in the experiment is both quantitative and qualitative. The quantitative data that is collected is numeric variables such as age, gender, years of study, BMC experience, Ten Types experience and number of ideas generated. The qualitative data collected consists of the string variables that are the innovation ideas each participant generated. In order to make all our data quantitative and statistically comparable, we use a professional business developer to rate the ideas in terms of their creativity, with a numerical value from 1-7.

5.7.2 Measures

The innovation ideas was analyzed in terms of the creativity. The creativity of the ideas was rated based on the definition of Dean et al. (2006), whereas we used 4 of Dean's 7 creativity dimensions. The creativity of the ideas was rated on a 7-point scale by a professional business developer from Bergen Technology Transfer (BTO). BTO works to develop innovation and commercialization of research in the Bergen region of Norway. They are the regional center of expertise for innovation and commercialization of research results (BTO, 2018). For the business developer to rate the ideas according to the creativity dimensions, we constructed a few questions that was given to him, that should be used to rate each idea, see appendix 11.2.7. By asking these questions as he rated *each* idea, he was able to give a specific score to each of the creativity dimensions for that idea.

The purpose of using an external business developer to rate the ideas, was to avoid our personal biases from interfering with how the ideas are rated. The business developer did not know which ideas were generated using which framework. Furthermore, the business development experience of the business developer is useful when rating the different ideas.

We had a short seminar with the business developer before he started rating the ideas to ensure that he understood how to use the questions in order to rate the ideas.

5.7.3 Measuring the average

We have measured the creativity as the average of all the ideas produced by one treatment group and compared it against the other treatment group and the control group. Because innovators are mainly interested in the *best* ideas, the average of all the ideas might not be the best measure. Several bad ideas can reduce the average in a group with the best ideas.

To check if several bad ideas reduce the average and affect the results, we will test the extreme values in 6.1.2.2 and see if any of the frameworks produce different results when we isolate the best ideas. When testing the extreme values, we are only interested in the ratings between six and seven as these are the values that support the best innovation ideas. In order to test for extreme values, we will first transform the dependent variables into new variables with a filter that copies the values equal or higher than 6 into new variables. Then, we will run one-way ANOVA, to check if one of the group's averages are different from the others, on each of the five dependent variables.

5.8 Sample and population

5.8.1 Population

The population of our study is business students from Norwegian School of Economics (NHH). This is the group that our sample is the subset from, and the group to which our results will be generalized. We chose to use NHH business students as our population based on the assumption that today's students are tomorrow's professionals. Consequently, the results in this thesis will have significance for organizations and decision-makers in the business sector.

5.8.2 Sample and sampling technique

The sample of our study is NHH students that were willing to participate in the study. We did not send out invitations to the study, but only invited students that were present at the NHH Bergen campus any of the 12 afternoons we conducted the experiment. We used a self-selection volunteer sampling technique, as participants were self-selected using incentivization. This means that we only used people from the target population that were available at the time and willing to take part. This method is based on convenience, as it is a

quick and low effort method of choosing participants. We only had participants that were present on campus at the given time of the study, and were willing to participate.

After we reached a sample of participants, each participant was randomly assigned to one of the three groups, using the randomization mechanism previously discussed. Using this randomization method, we ensured that the groups were equal in size and the participants randomly assigned. Ideally, the group size would be *minimum* 30 individuals each. Large sample size and randomization are important factors for our study, if we want to minimize the effect of variance in extraneous variables that we do not control for. After running the experiment for three weeks in the afternoon, we managed to recruit 105 participants, which we randomly assigned to one of the three groups until we had 35 in each group.

5.9 Descriptive statistics

We have provided a table with descriptive statistics from our experiment on the next page. The table is built on the descriptive statics from appendix shows the minimum (Min) and maximum values (Max), together with the mean and standard deviation (S.D) for all the variables we have measured, except gender. All the descriptive statistics shown in the table are at the group level and are gathered from the tables in appendix 11.3.1 and 11.3.2. The group level implies that we have assigned the 105 participants randomly into three groups with 35 participants in each group.

The table provides an overview showing the structure of our dataset. Our dependent variables are listed first and are *originality*, *implementability*, *applicability*, *effectiveness*, *priority*, *number of ideas*, and *perceived creativity*. The control variables are listed as survey variables below the dependent variables. Our independent variable consist of the Business Model Canvas, Ten Types, and Free ideation group and is shown in the blue, green, and gray column.

Group level	Business Model Canvas					Ten Types					Free ideation				
Dependent variables	N	Min	Max	Mean	S.D	N	Min	Max	Mean	S.D	N	Min	Max	Mean	S.D
Originality	35	2.00	6.25	4.30	0.91	35	3.33	6.00	4.78	0.60	35	2.50	6.00	4.70	0.84
Implementability	35	2.00	5.75	4.66	0.79	35	3.14	5.45	4.48	0.58	35	3.00	5.75	4.63	0.63
Applicability	35	2.28	6.00	4.39	0.77	35	3.17	5.20	4.38	0.50	35	3.20	5.38	4.33	0.58
Effectiveness	35	2.28	6.25	4.11	0.86	35	3.11	5.20	4.44	0.54	35	3.00	5.38	4.25	0.60
Priority	35	2.43	6.13	4.01	0.65	35	3.33	5.15	4.33	0.42	35	3.25	5.25	4.23	0.49
Number of ideas	35	2	11	6.03	2.26	35	3	13	6.91	2.38	35	2	12	6.31	2.47
Percieved creativity	35	1	4	2.40	1.01	35	1	5	2.51	1.25	35	1	6	2.46	1.27
Survey variables	N	Min	Max	Mean	S.D	N	Min	Max	Mean	S.D	N	Min	Max	Mean	S.D
Experience idea generation	35	1	5	2.63	1.24	35	1	5	2.17	1.12	35	1	5	2.40	1.24
Experience BMC	35	1	4	2.23	1.11	35	1	6	1.97	1.60	35	1	6	2.55	2.63
Experience Ten Types	35	1	4	1.23	0.60	35	1	5	1.23	0.81	35	1	4	1.20	0.58
Percieved difficulty	35	1	6	3.66	1.47	35	1	6	3.77	1.26	35	1	6	4.00	1.31
Percieved value	35	1	6	2.46	1.22	35	1	6	3.03	1.27	35	1	6	2.54	1.17
Year of study	35	1	5	3.77	1.26	35	1	5	3.63	1.24	35	1	12	3.59	1.26
Age	35	19	30	23.34	2.00	35	20	36	24.43	3.15	35	19	28	23.69	1.88

Table 5.1 - Descriptive statistics

5.10 Graphical visualizations

Gender difference between groups

To give a closer look at the data we have made several histograms showing the differences between the groups. We start by investigating the gender distribution from the experiment. From the figure below we can see that we had an overweight of males in the experiment with the highest percentage of males using the Ten Types framework.

Count	BMC	Ten Types	Control	Total
Male	19	21	19	59
Female	16	14	16	46
Total	35	35	35	105
Percentages	**BMC**	**Ten Types**	**Control**	**Total**
Male	54,3%	60,0%	54,3%	53,3%
Female	45,7%	40,0%	45,7%	43,8%

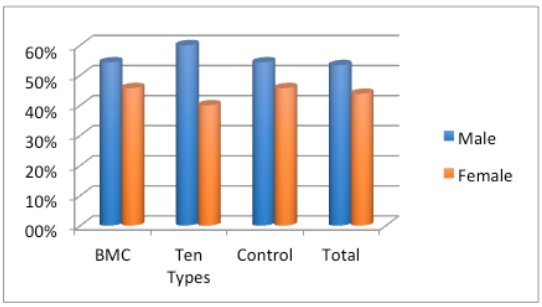

Figure 5.1 - Gender differences between groups

Average rating between groups

In the next visualization we observe the average ratings between the three groups across five of our dependent variables. The first four variables represent our chosen creativity dimensions and the last variable represents the priority that the professional business developer would give to the innovation idea in future innovation work. The innovation ideas were rated on a scale from one to seven with one being the lowest and seven the highest.

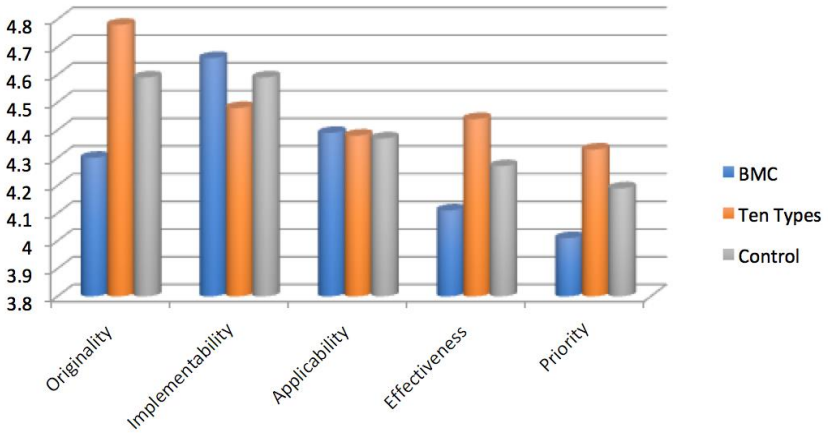

Figure 5.2 - Average ratings between groups

From the figure above we see that Ten Types framework produced ideas with much higher *originality* than the BMC framework. This difference was something we expected based the design of the frameworks, as we discussed in chapter 2.6.4. For *implementability*, we expected that the BMC framework would generate the most implementable ideas, while the Ten Types framework would generate the least implementable ideas. This was also a difference we expected based on the design of the frameworks. From the average comparison this expectation appears to be met. For *applicability*, the three groups perform similarly. For *effectiveness* and *priority*, we see that the Ten Types framework performs noticeably better than the other frameworks, followed by the control group, with the BMC scoring the lowest. To conclude, the Ten Types framework scores the highest on three of the dependent variables and comes out as the overall winner for the average scores.

Standard deviation across groups

From the group level standard deviations for the dependent variables in the figure below, we can see that the BMC has the highest standard deviation on all five variables, followed by the control group, with the Ten Types having the lowest standard deviation.

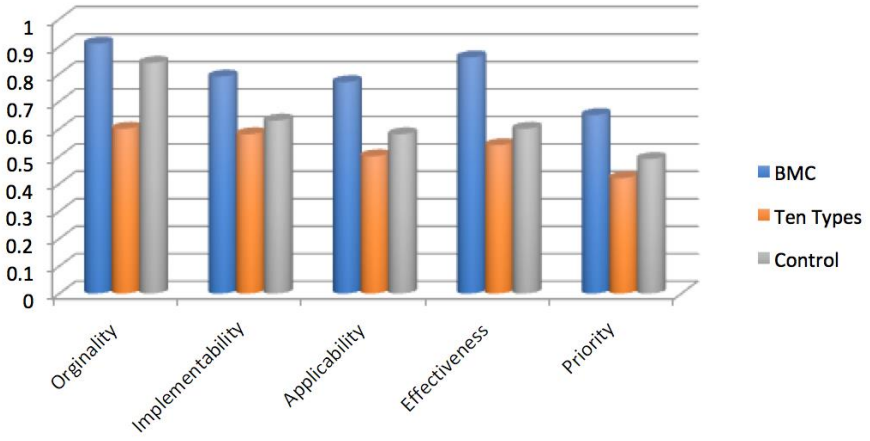

Figure 5.3 - Group level standard deviations

Average self-evaluations between groups

In the figure below, we see the average self-evaluations between the groups. We can see that the average experience with the BMC framework (BMC) is higher than the experience with the Ten Types framework (TEN), for all three groups. Moreover, the group that used the Ten Types framework had the lowest general ideation experience (GEN) among the three groups. These two observations are interesting as Ten Types was the clear winner in the average comparisons and can indicate that the Ten Types framework could have done even better if the participants would have had more experience both in general and with the framework

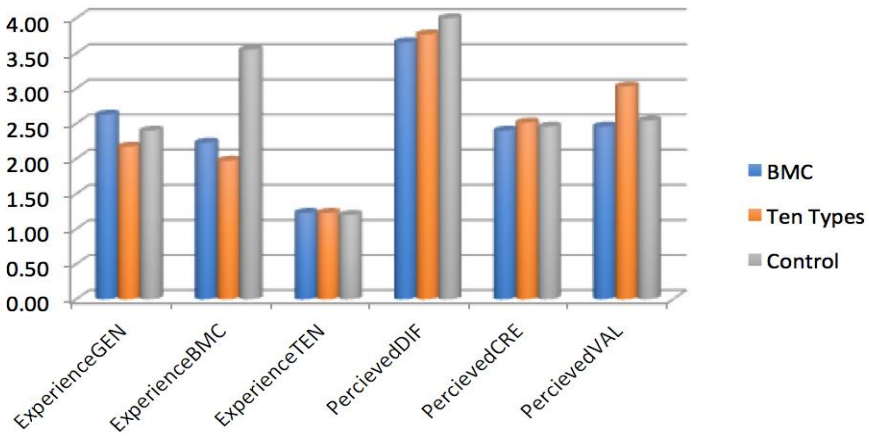

Figure 5.4 - Average self evaluations between groups

Another interesting observation is that the experience with the BMC is noticeably higher for the control group, but that the higher experience is not captured by the general experience generating ideas (GEN). This can indicate that the participants have experience with the BMC, but not with using it for idea generation. Other observation are that the perceived difficulty is the highest for the control group, and that the perceived creativity and value is the highest for the group that used the Ten Types framework.

5.11 Assumption testing

Before presenting the results, we will examine how evenly the experiment groups were assigned and how well the assumptions for performing a MANOVA and a t-test were met with the data from the experiment. Because the assumptions for conducting a MANOVA overlaps with all the assumptions for conducting a t-test, we will only focus on the assumptions for the MANOVA in the following text.

5.11.1 Test of random assignment

We measured our control variables through a post-experiment survey. The control variables were age, gender, year of study, experience generating ideas, experience with the BMC framework, and experience with the Ten Types framework. The descriptive statistics for the control variables can be seen from the descriptive statistics table in chapter 5.9 under the headline survey variables. To test if we managed to randomly assign participants to our three groups, we conducted a series of one-way ANOVA tests to check for differences between the groups on a five percent significance level. From the ANOVA tests in appendix 11.3.5, we can see the following results; *Gender* ($F(2, 102) = .15$, $p > .1$), *Age* ($F(2, 102) = 1.86$, $p > .1$), *Year of study* ($F(2, 102) = .12$, $p > .1$), *Experience generating ideas* ($F(2, 102) = 1.26$, $p > .1$), *Experience BMC* ($F(2, 102) = .48$, $p > .1$), *Experience Ten Types* ($F(2, 102) = .02$, $p > .1$). From the results, we see that there exist no significant differences between the three groups for any of the control variables, thus our randomization has been successful.

5.11.2 Test of MANOVA assumptions

Type of dependent and independent variables

The first two assumptions for MANOVA is that the dependent variables must be continuous and measure at a scale, and the independent variables must be categorical. Our five

dependent variables are measured at a scale from 1-7 and are continuous. Our independent variable consists of three independent groups and is categorical. Consequently, we meet the first two assumptions for conducting a MANOVA.

Independence of observations

The third assumption for MANOVA is that there is independence between the observations in each group or between the groups themselves. In our experiment, we had 105 different participants with no participant being in more than one group. Thus, the assumption of independence of observations is met.

Adequate sample size

The fourth assumption for MANOVA is that there is an adequate sample size. With a sample of 105 participant divided into three groups with 35 participants in each group we assume that we have meet the assumption of a adequate sample size for MANOVA.

Univariate outliers

A fifth assumption is that there should be no univariate outliers in each group of the independent variable for any of the dependent variables. To check for outliers we looked at the box-plots' for the five dependent variables. The box plots' are provided in appendix 11.3.3. From the plots we see that we have several outliers in our dataset. We have two types of outliers, the ones that are higher, and the ones that are lower than the average score. The outliers that are high indicates a high creativity from a participant on the dimension that the outlier is identified on and should not be removed from the dataset. The outliers that are low can indicate that the participants had very low creativity or that the participant did not actually try to generate ideas and should be discarded. To decide if any of the low outliers should be discarded we started by checking the outliers for each experiment group. We found that the BMC had participant 12 and 8 as outliers, Ten Types had participant 53, and the control group had participant 101, 98 and 91. Since all the groups have outliers we assume that it does not create too much of a bias in the data analysis. Participant 12 was an outliers for both applicability and priority. We checked participant 12 for number of ideas and found that the participant 12 produced 7 ideas, therefore we conclude that the participant cannot be discarded because of low effort. We see that the control group has two low outliers on originality, which can indicate that the participants were not able to produce original ideas without the help of a framework. In total we had 6 low outliers in the dataset, which equals

5,7 % of the participants. We chose to not discard any of these outliers as they were all real observations. From this section we conclude that the assumption of no univariate outliers has only been meet to some degree, and that it can potentially weaken the MANOVA.

Multivariate normality

A sixth assumption for MANOVA is that there is multivariate normality between the dependent variables. To make a best guess for the multivariate normality we tested the normality of each of the of the dependent variables independently for each of the three groups of the independent variable. We used the Shapiro-Wilk and Kolmogorov-Smirnov tests for normality and the SPSS output is provided in appendix 11.3.8. From the output we identify three distributions that are not normally distributed. First, we see from the Shapiro-Wilk test that the implementability and priority for BMC are significant ($p < .05$) with p-value of respectively .016 and .032. These p-values imply that the distributions for the implementability and priority for the BMC framework are not normally distributed. Second, we can see from the Kolmogorov-Smirnov test that the originality distribution for the Ten Types framework is not normally distributed with a p-value of .028.

From the previous paragraph we see that 3 out of 15 distributions are not normally distributed at a 5% significance level. To check if the assumption is violated we have generated histograms for the 15 variables and provided them as output from SPSS in appendix 11.3.9. From the output we see that all histograms look relatively normal distributed, therefore we conclude that the assumption of multivariate normality has been partially meet.

Linear relationships between dependent variables

A seventh assumption for MANOVA is that there is a linear relationship between each pair of the dependent variables for each group of the independent variable. If the variables are not linearly related the power of the test is reduced. We have provided a scatterplot matrix with histograms and a correlation matrix for each of the three groups of the independent variable in appendix 11.3.6.

For the assumption of a linear relationship to be perfectly meet there must be a linear movement between pairs of the dependent variables across the diagonal of the scatterplot boxes. If there is no linear relationship between the variables, the power of the MANOVA test is reduced. From our output data in 9.3.6 we can see that several of the dependent

variables in our experiment have a weak linear relationship. This assumption has clearly not been meet and as a consequence it weakens the power of our MANOVA. We will comment on the relationships that are strongly correlated (correlation > 0.599) in the next three paragraphs for the three groups from the experiment.

For the BMC framework we see that applicability has a strong positive correlation of .869 with effectiveness ($p < .001$) and priority .665 ($p < .001$). We also see a strong positive correlation of .750 between effectiveness and priority ($p < .001$).

For the Ten Types framework we see a strong positive correlation of .600 between originality and priority ($p < .001$). We also see that applicability has a strong positive correlation of .863 ($p < .001$) with effectiveness, and .758 with priority ($p < .001$). Moreover, there is a strong positive correlation between effectiveness and priority of .890 ($p < .001$).

For the control group we see a strong positive correlation of .603 between originality and priority ($p < .001$). We also see that applicability has a strong positive correlation with priority .876 ($p < .001$), and effectiveness .901 ($p < .001$). Furthermore, there is a strong positive correlation of .889 between effectiveness and priority ($p < .001$).

To sum up, we can see that the high positive correlation between applicability (Ap) and effectiveness (Ef) is consistent for the three groups. There is also a consistent positive high correlation between applicability (Ap) and priority (Pri) , and between effectiveness (Ef) and priority (Pri) across all three groups. For the ten Types framework and the control group, originality (Ori) is also significantly correlated with priority (Pri). To illustrate the relationship between the independent variables better we have provided an figure below.

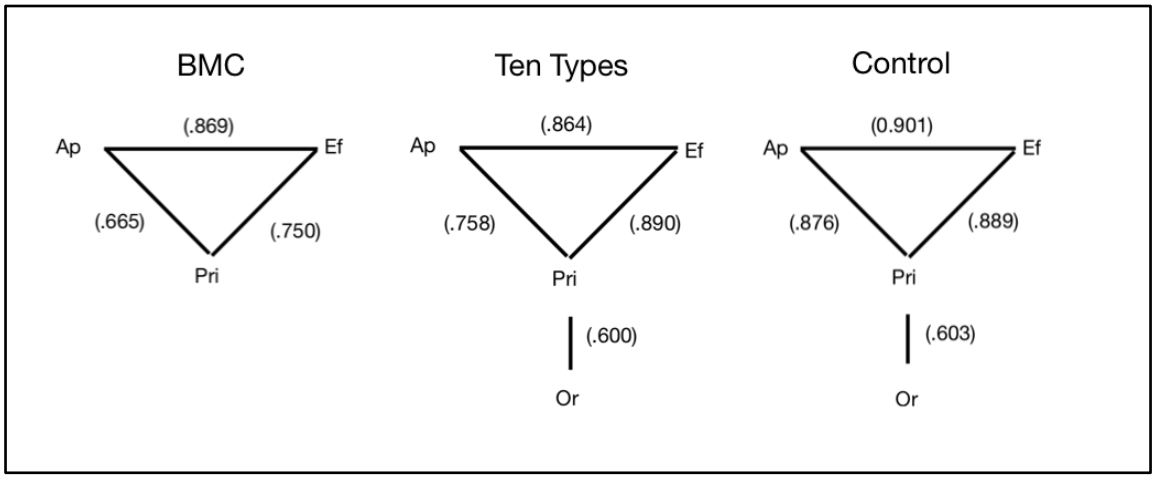

Figure 5.5 - Relationships between dependent variables

Homogeneity of variance-covariance

Assumption number eight for MANOVA is that there is a homogeneity of variance-covariance matrices. To test this assumption we have used the Box-M test for equality of covariance and because the Box-M test was significant we carried out a Levene's test to figure out where the problem may lie. We have provided both tests in their output form from SPSS in appendix 11.3.7.

In the Box-M test for the equality of covariance matrices the null hypothesis is that the observed covariance matrices of the dependent variables are equal across the groups. The test is significant ($p < .000$) and we therefore reject the null hypothesis and conclude that the observed covariance matrices of the dependent variables are not equal across the groups.

In the Levene's test of equality of error variances the null hypothesis is that the error variance of the dependent variables is equal across groups. The null hypothesis is that there are no difference between the variances of the groups. From the test we can see that none of the dependent variables have significantly different error variance, thus the error variances for the groups can be considered equal or homogeneous. We notice that the lowest p-value is for originality ($p = .057$). This implies that the originality dimension is the one with the highest differences in error variance.

The conclusion from the two tests is that the assumption of homogeneity of variance-covariance is violated for the Box-M test but not for Levene's test. Thus, the requirement is only partially meet.

Multicollinearity

The ninth assumption for MANOVA is that there is no multicollinearity. In order to use a MANOVA test the correlation between the dependent variables should be below 0,90 (Tabachnick & Fidell, 2012). Ideally the dependent variables should be moderately correlated with each other. From the correlation matrix provided in appendix 11.3.10 we see that all of our variables are correlated below 0.90 for the three groups. This means that the assumption of no multicollinearity has been meet.

We have made a summarizing table with conclusions to the assumptions for the MANOVA and provided it below.

Nr	Assumption	Test	Requirement meet	Additional Information
1 & 2	Types of variables	Research design	Fully	6.3.2 Type of variabels
3	Independence of observations	Research design	Fully	5.5.1 Research design
4	Adequate sample size	N.A	Fully	N.A
5	No Univariate outliers	Box plot	Partially	11.3.3 Appendix
6	Multivariate normality	Shapiro-Wilk Kologorov-Smirnov Histograms	Partially	11.3.8 Appendix 11.3.9 Appendix
7	Linear relationship between dependent variables	Scatterplot matrix Correlation matrix	Partially	11.3.6 Appendix
8	Homogeneity of variance-covariance	Box-M Levene's	Partially	11.3.7 Appendix
9	No multicolinarity	Correlation matrix	Fully	11.3.10 Appendix
Total evaluation of assumptions: Requirements are met at a satisfactory level				

Table 5.2 - Requirements for MANOVA

6 Research results

In this chapter we will first go through the results from hypothesis testing and then we will look at some additional findings. To make it easy for the reader to follow the results we have provided the descriptive statistics also in this chapter.

Group level	Business Model Canvas					Ten Types					Free ideation				
Dependent variables	N	Min	Max	Mean	S.D	N	Min	Max	Mean	S.D	N	Min	Max	Mean	S.D
Originality	35	2.00	6.25	4.30	0.91	35	3.33	6.00	4.78	0.60	35	2.50	6.00	4.70	0.84
Implementability	35	2.00	5.75	4.66	0.79	35	3.14	5.45	4.48	0.58	35	3.00	5.75	4.63	0.63
Applicability	35	2.28	6.00	4.39	0.77	35	3.17	5.20	4.38	0.50	35	3.20	5.38	4.33	0.58
Effectiveness	35	2.28	6.25	4.11	0.86	35	3.11	5.20	4.44	0.54	35	3.00	5.38	4.25	0.60
Priority	35	2.43	6.13	4.01	0.65	35	3.33	5.15	4.33	0.42	35	3.25	5.25	4.23	0.49
Number of ideas	35	2	11	6.03	2.26	35	3	13	6.91	2.38	35	2	12	6.31	2.47
Percieved creativity	35	1	4	2.40	1.01	35	1	5	2.51	1.25	35	1	6	2.46	1.27
Survey variables	N	Min	Max	Mean	S.D	N	Min	Max	Mean	S.D	N	Min	Max	Mean	S.D
Experience idea generation	35	1	5	2.63	1.24	35	1	5	2.17	1.12	35	1	5	2.40	1.24
Experience BMC	35	1	4	2.23	1.11	35	1	6	1.97	1.60	35	1	6	2.55	2.63
Experience Ten Types	35	1	4	1.23	0.60	35	1	5	1.23	0.81	35	1	4	1.20	0.58
Percieved difficulty	35	1	6	3.66	1.47	35	1	6	3.77	1.26	35	1	6	4.00	1.31
Percieved value	35	1	6	2.46	1.22	35	1	6	3.03	1.27	35	1	6	2.54	1.17
Year of study	35	1	5	3.77	1.26	35	1	5	3.63	1.24	35	1	12	3.59	1.26
Age	35	19	30	23.34	2.00	35	20	36	24.43	3.15	35	19	28	23.69	1.88

Table 6.1 - Descriptive statistics from experiment

6.1 Hypotheses testing

After examining the potential violations to the assumptions for the MANOVA analysis we can now proceed with the hypotheses testing. We will present our findings briefly in the following sections.

6.1.1 Quantity of ideas (H1-H3)

6.1.1.1 BMC

We hypothesized in H1 that the BMC framework would generate significantly more innovation ideas in a 20 minute ideation session compared to free ideation. From appendix 11.3.18, we see that the Ten Types group scored the highest on quantity of ideas ($M_{\text{Ten Types}} = 6.91$) with the free ideation group scoring second highest ($M_{\text{Free ideation}} = 6.31$), and the BMC scoring the lowest ($M_{BMC} = 6.03$; $p < .05$). These results imply that H1 is not supported.

Based on the one-way ANOVA test in appendix 11.3.18, we see that there is no significant difference between the groups ($F(2, 102) = 1.27$, $p > .1$).

6.1.1.2 Ten Types

We hypothesized in H2 that the Ten Types framework would generate significantly more innovation ideas in a 20 minute ideation session compared to free ideation. From appendix 11.3.18, we see that the Ten Types group scored the highest on quantity of ideas ($M_{\text{Ten Types}} = 6.91$) with the free ideation group scoring second highest ($M_{\text{Free ideation}} = 6.31$), and the BMC scoring the lowest ($M_{BMC} = 6.03$; $p < .05$). These results indicate that the Ten Types generates a higher quantity of innovation ideas. However, based on the one-way ANOVA test in appendix 11.3.18, we see that there is no significant difference between the groups ($F(2, 102) = 1.27$, $p > .1$). Consequently, H2 is not supported.

6.1.1.3 Relative quantity

In H3 we hypothesized that the Ten Types framework would have a significant positive effect on the quantity of innovation ideas generated in a 20 minute ideas session compared to the BMC framework. Based on the one-way ANOVA test in appendix 11.3.18, we see that there is no significant difference between the groups ($F(2, 102) = 1.27$, $p > .1$). Consequently, H3 is not supported.

Testing quantity of ideas without low numbers

In 6.1.1.1 to 6.1.1.3 we have looked at the average scores of number of ideas per participant. As we compared average number of ideas between the three groups, we do not see if any participants from the groups produced a particularly high number of ideas. To look closer at which group had the most participants with a high amount of ideas, we created a histogram in appendix 11.3.20 showing the count of participants on the y-axis and the number of ideas on the x-axis for the three groups. From the histogram we can see that the Ten Types framework has the participants that produce the highest amount of ideas. Because we have used the average previously it could be that one of the groups produce significantly more ideas, if we remove the lowest scores, so that the average is not reduced by participants producing extremely few ideas. To test for differences on extreme values we created three new variables with number of ideas higher or equal to five, six and seven. Thereafter, we tested if there existed differences between the groups for the three new variables by running ANOVA tests. From appendix 11.3.21 we can see the following test results for the new

variables.Ideas >=5 ($F(2, 75) = .25$, $p > .1$), ideas >=6 ($F(2, 62) = .59$, $p > .1$), and ideas >=7 ($F(2, 44) = .46$, $p > .1$). The results show that none of the new variables are significant. This strengthens the findings in 6.1.1.1 - 6.1.1.3, since we can conclude that the frameworks do not produce significantly different amounts of ideas, when we exclude the low numbers.

6.1.2 Measured creativity (H4-H5)

We hypothesized in H4 that using BMC as a tool for ideation has a significant positive effect on (a) *originality*, (b) *implementability*, (c) *applicability*, (d) *effectiveness*, and (e) *priority* of the innovation ideas generated, compared to using free ideation.

In H5 we hypothesized that using Ten Types as a tool for ideation has a significant positive effect on (a) *originality*, (b) *implementability*, (c) *applicability*, (d) *effectiveness*, and (e) *priority* of the innovation ideas generated, compared to using free ideation.

From the descriptive statistics in appendix 11.3.1, and the table provided in the beginning of chapter 5.9, we can see the minimum, maximum, and mean scores for the dependent variables together with the standard deviations. In chapter 5.10 we have provided a visualization of the mean scores and standard deviations from chapter 5.9. In the following paragraphs we will describe the mean scores for the five dependent variables and how they count towards getting support for hypothesis H4 and H5.

Comparing the mean scores between the three groups on *originality* we see that Ten Types group has the highest score ($M_{\text{Ten Types}} = 4.78$), with the free ideation group scoring second highest ($M_{\text{Free ideation}} = 4.70$), and the BMC group scoring the lowest ($M_{\text{BMC}} = 4.30$; $p < .05$). The reported means for *originality* count negative towards getting support for H4 (a), but positive for H5 (a).

Comparing the mean scores between the three groups on *implementability* we see that the BMC group has the highest score ($M_{\text{BMC}} = 4.66$) , with the free ideation group scoring second highest ($M_{\text{Free ideation}} = 4.63$) and the Ten Types group scoring the lowest ($M_{\text{Ten Types}} = 4.48$; $p < .05$). The reported means for *implementability* count positive towards getting support for H4 (b), but negative for H5 (b).

Comparing the mean scores between the three groups on *applicability* we see that the BMC group has the highest score ($M_{BMC} = 4.39$), with the Ten Types group scoring second highest ($M_{Ten\ Types} = 4.38$) and the free ideation group scoring the lowest ($M_{Free\ ideation} = 4.33$; $p < .05$). The reported means for *applicability* count positive towards getting support for H4 (c) and H5 (c).

Comparing the mean scores between the three groups on *effectiveness* we see that the Ten Types group has the highest score ($M_{Ten\ Types} = 4.44$), with the free ideation group scoring the second highest ($M_{Free\ ideation} = 4.25$) and the BMC group scoring the lowest ($M_{BMC} = 4.11$). The reported means for *effectiveness* count negative towards getting support for H4 (d), but positive for H5 (d).

Comparing the mean scores between the three groups on *priority* we see that the Ten Types group has the highest score ($M_{Ten\ Types} = 4.33$), with the free ideation group scoring the second highest ($M_{Free\ ideation} = 4.23$) and the BMC scoring the lowest ($M_{BMC} = 4.01$). The reported means for *priority* count negative towards getting support for H4 (e), but positive for H5 (e).

From the MANOVA test in appendix 11.3.11, we can see that there exist significant differences between the means of the three groups for *originality* ($F(2, 104) = 3.59$, $p < .05$) and *priority* ($F(2, 104) = 3.32$, $p < .05$). For *implementability* ($F(2, 104) = .75$, $p > .1$), *applicability* ($F(2, 104) = .08$, $p > .1$), and *effectiveness* ($F(2, 104) = 2.02$, $p > .1$), there are no significant differences between the means of the three groups.

From the bonferroni post hoc test in appendix 11.3.12, we can see where the differences between the groups are located.

From the test we see that *originality* between group one (BMC) and group two (Ten Types) is significant at a five percent level with a p-value = .043. We also see that *priority* between group one (BMC) and group two (Ten Types) is significant at a five percent level with a p-value of .040. Because the differences between the groups are not located between one of the two ideation frameworks and the control group, we conclude that hypotheses H4 and H5 are not supported for any of the dependent variables.

Testing extreme values for dependent variables

We mentioned in chapter 2.6.1 that the success at the ideation stage in innovation usually depends on the quality of the best ideas generated. In the previous paragraphs, we have compared the frameworks on the group level by comparing the average score for each participant, divided into the three respective groups, across the five dependent variables. By comparing the average it could be that one of the frameworks produce outstanding ideas, but that they are not noticed because we look at the average from each participant.

To see if one of the frameworks produced more outstanding ideas than the others, we plotted the count of the ideas on the idea level for each dependent variable, across the three groups. From the histograms in appendix 11.3.16 we can see that for *implementability*, *applicability*, *effectiveness* and *priority*, none of the frameworks perform much better than the others for the highest ratings of seven. This shows that none of the frameworks are particularly better than the others at producing extremely good ideas. What we can see from the histograms for the scores of six is already confirmed by our analysis of the averages. For example we know that the Ten Types framework is good at producing *original* ideas, BMC leads to high *implementability,* and that the Ten Types is good at producing ideas with high *priority*. However, we do notice that the control group produces some very *original* ideas. This is an important observation because it demonstrates that we cannot outrule free ideation when trying to generate innovation ideas that are highly *original*. Another observation is that the BMC group produces the most ideas with the lowest score, which can explain some of the high standard deviation in the scores from the BMC participants.

After observing the histograms we wanted to check if there were any significant differences between the groups. Particularly, we wanted to see if the control group produced significantly more outstanding ideas than the BMC framework. To check if there were any significant differences we transformed our five dependent variables into new variables, which contained only the scores higher or equal to six. This allowed us to test for differences between the groups for only extreme values. From the descriptive statistics in appendix 11.3.19, we can see the means for the five dependent variables we want to test for extreme values.

Comparing the mean scores for *originality* we have see that the free ideation group has the highest score ($M_{\text{Free ideation}} = 6.28$), followed by the BMC ($M_{\text{BMC}} = 6.20$), and the Ten Types ($M_{\text{Ten Types}} = 6.19$). For i*mplementability* the free ideation group has the highest score (M_{Free}

$_{\text{ideation}}$ = 6.03) followed by the Ten Types ($M_{\text{Ten Types}}$ = 6.01) and the BMC (M_{BMC} = 6.00). Comparing the mean scores for *applicability* we see that the BMC has the highest score (M_{BMC} = 6.02), followed by the Ten Types ($M_{\text{Ten Types}}$ = 6.01), and the Free ideation group ($M_{\text{Free ideation}}$ = 6.00). For *effectiveness* the BMC has the highest mean score (M_{BMC} = 6.07), followed by the Ten Types ($M_{\text{Ten Types}}$ = 6.06), and the free ideation group ($M_{\text{Free ideation}}$ = 6.05). Comparing the mean scores for *priority* we see that the BMC has the highest mean score (M_{BMC} = 6.16), followed by the ($M_{\text{Ten Types}}$ = 6.12), and the free ideation group ($M_{\text{Free ideation}}$ = 6.12).

From the ANOVA tests in appendix 11.3.19 we see that none of mean scores for the dependent variables are significantly different; *originality* ($F(2, 269) = 1.42$, $p > .1$), *implementability* ($F(2, 233) = 1.12$, $p > .1$), *applicability* ($F(2,(188) = .44$, $p > .1$), *effectiveness* ($F(2,183) = .07$, $p > .1$), and *priority* ($F(2, 71) = .10$, $p > .1$). If one of the groups had outstanding ideas that we did not find when we used the average ratings previously, these ideas would have made an impact in this test. Consequently, the validity of our initial test is strengthened as we did not find any significant differences when we looked at the extreme values.

6.1.3 Perceived creativity (H6-H7)

We hypothesized in H6 that using the BMC as a tool for ideation would decrease the *perceived creativity* compared to the free ideation group. In H7 we hypothesized that using the Ten Types as a tool for ideation would decrease the *perceived creativity* compared to the free ideation group.

From the graphical visualization of the descriptive statistics in 5.10, we can see that the perceived creativity is the highest for the Ten Types group, followed by the control group, and the BMC group. In appendix 11.3.18 we have provided a ANOVA to check for significant differences of the perceived creativity between the groups. From the ANOVA test we see that none of the means were significantly different ($F(2, 102) = .08$, $p > .1$). Consequently, H6 and H7 are not supported.

6.1.4 Relative strengths and weaknesses of the frameworks (H8-H9)

In H8 we hypothesized that using BMC as a tool for ideation would lead to innovation ideas with higher *implementability* compared to the Ten Types framework.

In H9 we hypothesized that Using Ten Types as a tool for ideation leads to innovation ideas with higher *originality* compared to the BMC framework.

From the descriptive statistics in the beginning of this chapter and the visualization of the descriptive statistics in 5.10, we can see that the Ten Types framework has the highest *originality*, followed by the control group, with the BMC framework scoring the lowest. For the *implementability* the BMC framework scores the highest, with the control group coming in second, and the Ten Types framework scoring the lowest. From the MANOVA test in appendix 11.3.11, we know that there existed a difference between the means of the dependent variables *originality* and *priority*. From the bonferroni test in appendix 11.3.12 we can see that the difference for both *originality* and *priority* is located between the Ten Types and the BMC framework. Both differences are located with 95 % confidence ($p < .05$).

From the the t-tests in appendix 11.3.13 and the descriptive statistics in the beginning of this chapter, we can see that the Ten Types framework scores significantly higher on *originality (M=4.78, S.D=0.60),* than the BMC framework M=4.30, S.D=0.91), conditions; $t(34) = -2.530$, $p = .016$. We also see that the *Ten Types framework* scores significantly higher on *priority* (M=4.33, S.D=0.42), than the BMC framework (M=4.01, S.D=0.65), conditions; $t(34) = -2.196$, $p = .035$. Consequently, only H9 is supported statistically.

6.2 Summary of hypotheses testing

We have made a table to summarize the findings from the hypothesis testing. The table is provided on the next page.

Hypothesis	Decription	Test type	P-value	Outcome	Additional information
H1	Quantity of ideas for BMC is higher than for control group	ANOVA	.285	Not supported	Apppendix 11.3.17
H2	Quantity of ideas for Ten Types is higher than for the control group	ANOVA	.285	Not supported	Apppendix 11.3.17
H3	Quantity of ideas for Ten Types is higher than the BMC framework	ANOVA	.285	Not supported	Apppendix 11.3.17
H4	Using BMC gives ideas with higher (a) originality, (b) implementability, (c) applicability, (d) effectiveness, and (e) priority compared to the control group	MANOVA Bonferroni	a) .031 b) .473 c) .921 d) .138 c) .040	Not supported - The difference is not located with the control group	Appendix 11.3.11 Appendix 11.3.12
H5	Using Ten Types gives ideas with higher (a) originality, (b) implementability, (c) applicability, (d) effectiveness, and (e) priority compared to the control group	MANOVA Bonferroni	a) .031 b) .473 c) .921 d) .138 c) .040	Not supported - The difference is not located with the control group	Appendix 11.3.11 Appendix 11.3.12
H6	Using the BMC as a tool for ideation will decrease percieved creativity compared to the control group	ANOVA	.921	Not supported	Appendix 11.3.18
H7	Using the Ten Types as a tool for ideation will decrease percieved creativity compared to the control group	ANOVA	.921	Not supported	Appendix 11.3.18
H8	Using BMC as a tool for ideation will lead to ideas with higher implementability compared to the Ten Types framework	MANOVA Bonferroni	b) .473	Not supported - Implementability (b) is not significant	Appendix 11.3.11 Appendix 11.3.12
H9	Using Ten Types as a tool for ideation will lead to ideas with higher originality compared to the BMC framework	MANOVA Bonferroni T-test	a) .031	Supported $\alpha = 0.05$	Appendix 11.3.11 Appendix 11.3.12 Appendix 11.3.13

Table 6.2 - Summary of hypothesis testing

6.3 Additional results

6.2.1 Controlling for moderating variables

Experience variables

To check for moderating variables, we conducting a MANOVA with the *idea generation experience*, *BMC experience, and Ten Types experience* as potential moderating variables for the effect of the independent variable on *originality*, *implementability*, *applicability*, *effectiveness*, and *priority*.

From the MANOVA test in appendix 11.3.14 we see from the corrected model that *originality* and *priority* are still significant ($F(5, 104) = 2.47$, $p < .05$), ($F(4,104) = 2.50$, $p < .05$) with the moderating variables. We can see that *idea generation experience* and *BMC experience* are not significant as moderating variables for any of the dependent variables. However, we see that *Ten Types experience* is significant as a moderating variable for *effectiveness* ($F(1,104) = 4.98$, $p < .05$). This an interesting finding because we know that the experience with the BMC and Ten Types frameworks was different across the groups.

From the descriptive statistics in the beginning of this chapter, we can see that the experience with the Ten Types framework was (M_{BMC} = 1.23), ($M_{Ten\ Types}$ = 1.23), and ($M_{Free\ ideation}$ = 1.20) for the three groups. If we look at the experience with the BMC we can see that the reported experience was (M_{BMC} = 2.23), ($M_{Ten\ Types}$ = 1.97), and ($M_{Free\ ideation}$ = 2.55) for the three groups. By calculating the average experience across all groups we get ($M_{Ten\ Types}$ = 1.22) for the Ten Types framework and (M_{BMC} = 2.25) for the BMC framework. That implies that the participants were on average one whole point more experienced with the BMC framework across the three groups. Despite that the participants were more experienced with the BMC framework, the Ten Type framework came out as the winner on *originality*, *effectiveness* and *priority*. If the participants would have had more experience with the Ten Types framework we suggest that the outcome could have been different.

7 Discussion of results

In this chapter, we will discuss our research results. We will first discuss the theoretical implications, second we will discuss the managerial implications, and finally, we will discuss the ethical aspects of our research.

7.1 Theoretical implications

7.1.1 Theoretical implications from literature review

In the beginning of this thesis, we discussed how the theoretical landscape on BMI and BM frameworks is currently dispersed and inconclusive. This is both due to the dispersed nature of this academic field, and due to the sheer number of different BM frameworks. We addressed this issue in our literature review by providing overview of the current BM and BMI literature. In our literature review we have discussed some common scholarly perspectives on Business Models and discussed the challenges that are present in the current research on BMI. This discussion highlighted both why an empirical contribution was sought after, and why it was advantageous to this specific field of research. In our literature review, we provided a broad overview of 30 different BM frameworks, as well as a closer comparison of five selected frameworks specifically when generating innovation ideas for Business Models.

Our literature review can help scholars to achieve a better conceptual grasp on the current BM and BMI frameworks available, and how they can be used as ideation tools. Moreover, the comparison of the frameworks can help scholars to see how these frameworks can be used for idea generation. The comparison can also help scholars to identify situations where certain frameworks are better suited than others. Furthermore, we have clarified why empirical work in this research field is and was necessary to advance the understanding of how BM frameworks can be used for idea generation. Our literature review can be beneficial for scholars who initiate new research on BMI and BM frameworks. In particular, the literature reviews on the Business Model Canvas and Doblin's Ten Types represent profound elaboration on the two frameworks.

Through the work of this thesis we have created the most complete review of the BMC and Ten Types frameworks currently available. We have provided a comparison between the

frameworks to help managers see their differences clearly, and to know which framework to use when. In our comparison we have highlighted the framework's similarities, differences, advantages, disadvantages, and how they are suitable for different types of cooperation and entrepreneurship.

We have proposed a BMC framework with the Ten Types of innovation mapped within the BMC. In this BMC, we have used the color coding from the Ten Types of Innovation, and made suggestions for how to use them together to create better Business Models and get synergy effects. When the BMC is used in combination with the Ten Types framework, the Ten Types of innovation can help to overcome the dominant logic of the current BM that is making it hard to come up with *original* innovation ideas. The Ten Types of innovation can help managers to consider new innovation ideas, while being detached from the current Business Model.

To be able to compare the two BM frameworks we needed to review the literature on idea generation and creativity to an optimal way to rate the innovation ideas generated from the innovation sessions. From this literature review we found that most researchers focus solely on the quantity of innovation ideas, with the implicit assumption that more ideas will lead to better ideas. However, we find that if the researchers that focus on other dimensions than quantity tend to focus on the quality of the innovation ideas. This finding lead us to review more articles on the quality of ideas, and we found that scholars regularly take the quality and creativity of the innovation idea for being the same thing. This directed us towards the literature on creativity, where we found that quality is merely a sub-dimension of creativity. This is an important finding, because it demonstrates that there is a need for a clarification on how to rate innovation ideas. We have provided this clarification in our literature review.

We suggest that it is not sufficient to measure only the quantity, or quality of the innovation ideas. Scholars should measure the creativity of the innovation ideas, as it has the quality dimension provided as a sub-dimension because it gives the innovator more possibilities for how to organize the rated ideas and is a more accurate and clear construct. To facilitate the use of creativity as first hand construct for rating innovation ideas, we have provided a comprehensive overview of Dean et al., 2006 creativity definition to help scholars comprehend the creativity construct and the sub-dimensions with more ease. Furthermore, we have modified the creativity construct especially for *corporate entrepreneurship*. This

modification together with our explanation of how to measure innovation ideas, should be clarifying for *corporate entrepreneurs* who want to organize their innovation ideas in a meaningful way.

To sum up, it is not sufficient to measure the quantity or quality of the innovation ideas, we suggest that innovators should measure the creativity of the innovation ideas. Additionally, we have contributed by creating a dependent variable we have called *priority*. The *priority* variable measures the priority of the innovation ideas in the further innovation work, thus it measures the value of the innovation ideas. It can be useful for *corporate entrepreneurs* to follow our example, and include a variable measuring the *priority* in their innovation work. Scholars and *new venture entrepreneurs* should also include a priority variable in their research or innovation work to measure the value of the innovation ideas. The work we have done in the literature review of this thesis, together with the methodology, results, limitations, and advice for further research, can serve as time saving literature for both scholars who focus on innovation and entrepreneurship.

7.1.2 Theoretical implications from experiment

Our main objective in this thesis was to contribute to the existing theory by producing empirical evidence on the effects of using two BM frameworks for idea generation and BMI. To our knowledge, no scholars before us have empirically tested and compared the BMC and the Ten Types in their ability to facilitate idea generation.

From the experiment we found support for one of the nine hypotheses at a five percent significance level. We found that the Ten Types framework produced ideas that had a significantly higher *originality* and *priority*, than the BMC framework. This implies that the Ten Types framework is useful as an ideation tool to produce ideas of high *originality* and *priority*. Neither of the frameworks had a statistical significant effect on any of the creativity dimensions compared to the free ideation group.

From figure 5.3 we can see that the average standard deviations between the three groups appear to be systematically different. We found that the Ten Types framework had the lowest standard deviation on *all* dimensions, with the BMC framework having the highest standard deviations on *all* dimensions. This entails that the participants in the Ten Types group

produced more consistent results. The low standard deviations of the Ten Types framework strengthen the results produced by the Ten Types group.

If we observe the average ratings from figure 5.2, we can see that the BMC framework scored low on *originality*, *effectiveness*, and *priority*, compared to the other groups. Moreover, we can observe that the free ideation group scored higher than the BMC group on *originality*, *effectiveness*, and *priority*. This is an interesting finding, since we hypothesized both frameworks to outperform the free ideation group on all creativity dimensions. Within the context of our study, the BMC produced ideas that scored surprisingly low on *originality*, effectiveness and *priority*. This was the result, despite the fact that the average experience with the BMC framework was on average one point higher than the experience with the Ten Types for all three groups. These are interesting indications on the differences between the three groups.

We followed up the research from Eppler et al. (2011) on the effects on perceived creativity by using the BMC. The scholars found that when a team used the BMC to facilitate collaboration as they generated innovation ideas, the perceived creativity dropped compared to the teams that did not use the BMC. In our study the participants generated innovation ideas alone, thus the results might not be comparable. In our study we found that the perceived creativity was the lowest for the group the had the BMC framework. This result supports the finding of Eppler et al. (2011) to the degree that it is comparable. In a similar vein as Eppler et al. (2011), we suggest that this result is was created by the rigid structure of the BMC, and that it affected the individual's perceived creativity negatively. More surprisingly, we found that the perceived creativity was the highest for the Ten Types framework. This result might come from the fact that the framework was new and exciting for several of the participants. Moreover, the Ten Types framework is more open in the design, which can induce a higher perceived creativity. We can also observe that creativity of the group with the Ten Types of Innovation was the highest on average both for perceived and real creativity.

Concerning the *perceived difficulty* of the ideation process, the free ideation scores the highest. This is not very surprising as they had no tool to help them generate ideas. We note that the BMC framework has the highest experience and the lowest perceived difficulty.

Thus, we can infer that the familiarity with the BMC framework helped to reduce the perceived difficulty of the ideation process.

For the *perceived value* of the innovation ideas we see that the Ten Types framework is a clear winner. Hence, we can derive that the participants who had the Ten Types framework at their disposition believed that they produced more valuable ideas. This is an interesting finding because they did score significantly higher on *originality* and *priority*. The *priority* dimension measures how much the business developer would prioritize the idea in the further innovation work, thus it measures the estimated value of the innovation ideas. Therefore we see that the perceived value from the participant of the Ten Types framework is aligned with the reality.

7.1.3 Relevance of findings

Our results should be taken into consideration in future works on the topic by scholars working with BMI. Previous research has been accumulative and mostly conceptual, where BM frameworks have been discussed and briefly compared, but not empirically tested (Foss & Saebi, 2017). We have contributed with empirical research, testing two BMI frameworks in their ability to generate innovation ideas. The results of our research has relevance for scholars working with New Business Development in research fields such as *innovation*, *entrepreneurship*, and *corporate entrepreneurship.*

The widely known and frequently used BMC has received much academic attention and praise, while hardly any scholarly citations exist for the Ten Types of innovation. From our analysis we found that the experience with the BMC was on average one point higher than the average experience with the Ten Types, among all three groups. Despite that the participants had more experience with the BMC, the Ten Types of innovation framework still outperformed the BMC on *originality* and *priority* at a five percent significance level. Based on the findings in our study, we propose that the Ten Types should be considered and acknowledged as a valid complementing framework to the BMC in future scientific work.

In our literature review we mapped out the Ten Types within the BMC and suggested how the frameworks can be used together to create synergy effects and increase the *originality* of the innovation ideas. Based on our findings from the experiment, we now know that the

BMC framework can help to generate innovation ideas with high *implementability*, while the Ten Types framework can facilitate innovation ideas with high *originality* and *priority*.

Although not significant, we observed that the Ten Types framework created innovation ideas that scored very high on *effectiveness*. We found experience with the Ten Types framework to be a moderating variable for the *effectiveness* of the innovation ideas. Moreover, we know that the participants in general had low experience with the Ten Types framework. Therefore, we suggest that *effectiveness* could have been significant as a third *strength* of the Ten Types framework, if the participants would have had more experience with the framework. This implies that if the Ten Types framework was used together with the BMC framework, it could serve to generate innovation ideas with higher *originality*, *effectiveness,* and *priority*.

We propose that managers can create better Business Model by combining the BMC and the Ten types framework. When we looked at the extreme values for the three groups we found that the free-ideation group produced the most highly original ideas with a score of seven. This is an important finding as it illustrates that free-ideation can stimulate highly *original* ideas and should not be excluded from the innovation work. We suggest that free ideation is incorporated as a supplement to the BMC and Ten Types of innovation frameworks when generating innovation ideas. These findings should be noted and tested by scholars in further empirical work on the subject.

7.2 Managerial implications

Our results have implications for managers and decision-makers working in organizations with *corporate entrepreneurship*, who seek to innovate the company's business model. But the results will also provide guidance for traditional *new venture entrepreneurs*. In this chapter, we will demonstrate how our findings can be useful in practice, and how they could influence the way companies approach their ideation processes and their Business Model Innovation.

7.2.1 Comparison of BM frameworks

Creativity is a critical condition for innovation, thus managers should have an incentive to stimulate the creativity in their organization. We suggest that BM frameworks should be considered as useful tools that can facilitate creative idea generation. If managers and

decision-makers do not have the necessary overview of the currently available BM framework, they will struggle to select the most suited framework to solve the challenge they are facing in their business. The overview from our literature review on the BM frameworks can be useful for managers who consider using a BM framework for BMI in their company. Our literature can serve as a support when managers need to decide which BM framework to use for the challenges in their company.

7.2.2 Guidance for managers

We suggest that our findings can serve as advice for decision-makers, and guide them in their decisions regarding BMI. Through our literature review, we found that the BMC and the Ten Types has been acknowledged and used by large companies and numerous practitioners as ideation and BMI tools. We suggest that even more companies could benefit from using the BMC and the Ten Types to facilitate the ideation process.

The broad overview of the 30 different frameworks, as well as the close comparison of five selected frameworks for generating innovative ideas can be useful for managers when the consider which framework to use in their innovation work.

Our literature review can help managers to achieve a better conceptual grasp on the current BM and BMI frameworks available, and how they can be used as ideation tools. Moreover, the comparison of the frameworks can help managers to see how these frameworks can be used for idea generation. The comparison can also help managers to identify situations where certain frameworks are better suited than others. In particular, the literature reviews on the Business Model Canvas and Doblin's Ten Types can be very useful for managers. Through the work of this thesis we have created the most complete review of the BMC and Ten Types frameworks currently available. We have provided a comparison between the frameworks to help managers see their differences clearly, and to know which framework to use when.

We have also proposed a BMC framework with the Ten Types of innovation mapped within the BMC. In this BMC, we have used the color coding from the Ten Types of Innovation, and made suggestions for how to use them together to create better Business Models and get synergy effects. When the BMC is used in combination with the Ten Types framework, the Ten Types of innovation can help to overcome the dominant logic of the current BM, which

is making it hard to come up with *original* innovation ideas. The Ten Types framework can help the managers to consider new innovation ideas, while being detached from the current Business Model.

To facilitate the use of creativity as a first hand construct for rating innovation ideas, we have provided a comprehensive overview of Dean et al., 2006 creativity definition to help managers comprehend the creativity construct and the sub-dimensions with more ease. We recommend managers to measure the creativity of the innovation ideas, and not just the quantity or quality. To help managers, we have modified the creativity construct especially for *corporate entrepreneurship*. This modification together with our explanation of how to measure innovation ideas, should be clarifying for *corporate entrepreneurs* who want to organize their innovation ideas in a meaningful way.

Another implication for managers is advice on how to measure the value of their innovation ideas. We have created a dependent variable we have called *priority*. The *priority* variable measures the priority of the innovation ideas in the further innovation work, thus it measures the value of the innovation ideas. It can be useful for *corporate entrepreneurs* to follow our example, and also include a variable measuring the *priority* in their innovation work. Scholars and *new venture entrepreneurs* should also include a *priority* variable in their research or innovation work to measure the value of the innovation ideas.

The Ten Types of Innovation

The Ten Types framework emerged as the clear winner in our experiment, scoring significantly higher than the BMC on both *originality* and *priority*. From the descriptive statistics we can see that the Ten Types produces the most ideas, and scored the highest on *originality, effectiveness* and *priority*. Furthermore, we found that experience with the Ten Types framework was a significant moderating variable for the *effectiveness* dimension of the creativity construct. This is important for managers, as it implies that experience with the framework is important for the ideation result.

The Business Model Canvas

From our experiment the BMC was significantly outperformed by the Ten Types on the *originality* and *priority* of the ideas. Our descriptive statistics indicated that free ideation group scored higher than BMC on *originality*, *effectiveness* and *priority*, although this was

not statistically significant. However, the BMC framework has the highest *implementability* for the innovation ideas. This is important for managers, as they can generate innovation ideas with higher *implementability* by using the BMC.

Van der Pijl et al. (2016) argued that the BMC can be an excellent tool for ideation, if the users know how to use it for that purpose, and describe four techniques that supports practitioners in using the BMC for ideation effectively. Managers can attempt to use several of these techniques to get the best results from the BMC framework. The techniques are provided in section 2.4.3.1.

We suggest that managers should use our comparison of the two frameworks and utilize the frameworks together. The BMC can serve to generate innovation ideas with high implementability, thus we propose that it is well suited as a diagnostic tool for teams to generate and evaluate innovation ideas with high implementability. We propose, that managers combine the BMC and Ten Types frameworks to use the frameworks for their strengths and get synergy effects from using both frameworks. The fit of the innovation ideas generated with the Ten Types of innovation can be evaluated within the BMC by using the BMC we provided with the Ten Types of innovations mapped within the BMC.

As a last advice, we advise managers to study the literature review of this thesis, together with the methodology, results, limitations, and especially the further research chapter. In the advice for further research managers can pick up our experiences and use it in their future innovation work. We suggest that the work in our thesis can serve as time saving literature for managers who focus on innovation and entrepreneurship.

7.3 Ethical considerations

Research ethics are about the moral principles and values in scientific research, and serves as norms for conduct in terms of what is regarded as acceptable and unacceptable behavior in research. Research ethics applies to all situations in the research where there is a potential harm of any kind to anybody, including those who are subjects of the study, and those who are affected by the study (Resnik, 2015).

7.3.1 Experiment ethics

We have taken several ethical considerations as a part of the experimental strategy. As researchers, we have to demonstrate responsibility in collecting, storing, analyzing and presenting our data, as well as conducting the experiment with professionalism and objectivity. Firstly, experiment participation was voluntary, and participants were self-selected using incentivization. Thus, no students were forced to participate, and also had the choice of dropping out of the study at any time.

An important concern in many experiments is how much information the researchers should give the participants, and whether it is ethical to deceive participants. The participants received enough information for them to give their *informed* consent for participation. We had no reason to deceive participants, but it was necessary to withhold some details regarding the purpose of the experiment, in order to avoid getting biased answers. Hence, we revealed only superficial information regarding the topic, and how much time and effort was required from the participants, but did not disclose any details beyond this. A common practice in psychology experiments, is the debriefing of participants after the experiment has concluded. The debriefing includes providing participants with accurate and appropriate information regarding the purpose of the study, and sometimes what the findings indicate. We did not debrief any participants, and in hindsight, that would have an ethical act that we should have conducted.

Furthermore, we ensured all participants' anonymity, as the survey did not include any sensitive questions, that would cause the participants to disclose their identity. The participants were asked not to register their name to the information handout, and when collecting the handouts, we made sure they were facing down. This way, we made sure no submissions could be connected with any of the participants. Thus, we have no records of sensitive personal data from the participants, and consequently not required notify our project to the government. Sensitive personal data is defined as data that is clearly identifiable to a natural person (Irwin, 2018). The data was *only* collected using physical sheets, we took no recordings, photos or videos of the participants.

7.3.2 Researcher ethics

To ensure ethical conduct in our methodology and analysis we have described our methodological choices explicitly and clearly in text. This is to ensure total transparency in

the methods used in the study, and to allow for replicability and verifiability by other researchers.

We have placed a considerable effort into referencing with integrity and honesty, which means that we give credit where it is due. Thus, we avoid the risk of plagiarism, which is both unethical and negatively affects the credibility of our thesis. We have also made an effort to cite our sources accurately, in that our thesis accurately reflect what the sources said. This is important because other scholars might read the study and cite it, assuming it is trustworthy. To ensure that our sources are of high quality and trustworthiness, we have mainly used peer-reviewed sources from recognized academic journals.

During the data analysis phase we have focused on objectively conducting all the relevant analyses, taking all moderating variables into account, and presenting the analysis as accurately and fully as possible.

8 Research limitations and further research

Research limitations concern data quality and other constraints on generalizability, applications to practice, and the utility of the research findings (Price & Murnan, 2004). In this chapter we will first discuss the limitations of our research, and then give suggestions for further research on the topic of using BM frameworks for Business Model Innovation.

8.1 Limitations of research

In the following chapter we will discuss the limitations in our research. We have structured this discussion into limitations caused by the artificiality in the research design, and limitations caused by the quality of our data.

8.1.1 Artificiality in research design

The broader issue of the artificiality in the context in which the experiment took place will always be a limitation of the findings produced by using an experimental research design. Artificiality of the experiment can impact the external validity of our findings. In this subchapter, we will discuss the time frame of the experiment, our sample, and our choice of using individual ideation in the experiment, can have affected the external validity.

Time frame of experiment

The time frame of the experiment was 20 minutes and serves as an example of the artificiality of our research design. In a real life setting this limited time frame would most likely not be present, and the individual or group of individuals would be able to solve the case over a significantly longer time span.

Students as sample

By using business students as our population and sample, it has contributed to the artificiality of the experiment. We want the results form the experiment to be relevant for decision-makers in the business sector. As discussed in the methodology chapter, our sampling was mainly based on a necessary convenience time constraint for this thesis. This is a necessary limitation for our thesis that can have affected the external validity.

Individual ideation

The business case in the experiment was solved by individual participants, rather than groups. We have explained that we use individual ideation in order to avoid several unfortunate group dynamics (Sverdrup & Schei, 2011). However, as most corporate ideation processes occur in teams, using individual ideation can be seen as a limitation in our study.

8.1.2 Data quality

Scientific research can also be limited by the validity and reliability of the results. In this subchapter we will first discuss the internal and external validity of our research, then we will elaborate on the reliability of or research.

8.1.2.1 Significance of findings

Only one of our hypotheses turned out significant at the desired five percent level. If we had a larger sample size with more participants in each group, our results could have been more statistically significant. We found experience to be a moderating factor for the results, and we found that the participants had different experience with the frameworks on average. This moderating effect could have been mitigated if we had thoroughly introduced the frameworks and lectured the participants before the experiment, so that the differences in experience with the frameworks had been smaller. In section 8.2, we will discuss future research, and elaborate on this.

8.1.2.2 Internal validity

Validity refers to the relevance of the data collected, and is about whether the data collected and the methods used are relevant towards the research problem and research question (Saunders et al., 2016). Validity is usually divided into internal and external validity. Internal validity refers to the causality of the relationship between the variables tested. If the change in the dependent variable can be credited to a manipulation in the independent variable, the study has internal validity.

We have used an experimental strategy, which has enabled us to exert significant control over extrinsic and intrinsic variables, thus it has allowed us a high degree of control over potential confounding and moderating variables. Consequently, the internal validity of our study is strengthened.

The experimental strategy we used has enabled us to control the introduction of the independent variable, so that the direction of the causation can be determined (Frankfort-Nachmias & Nachmias, 2008). In the lab experiment, all participants were given the same information and case, the same amount of time to answer the case, and had to answer the case under the same circumstances. In this way, the only difference we *exposed* the participants for, was the manipulation, which randomized. Additionally, we used a post-experiment survey to gain experimental control, to minimize the effect of moderating variables. The experience variables captured from the survey was controlled for in our analysis. The randomization, experimental control and post-survey has positively impacted the internal validity of our study.

We recognize the difficulties in terms of how potential moderating variables can impact the dependent variables. No matter how many moderating variables we attempt to control for, the individual differences between the participants will always be present and affect the creativity of the ideas they generate. This is a limitation of our study, as our objective is to test the *frameworks*, rather than the *individuals*. For example, variations in individual creativity between participants have not been controlled for. We captured the individuals' self-perception of how creative their ideas were, but to control for the individual creativity would make it necessary to operationalize and measure individual creativity. This could have

been measured through a pretest for individual creativity, but we chose not to conduct such a measure.

In our experiment all groups had 20 minutes from the start to read the experiment scenario, read the additional material and to generate innovation ideas. In terms of time available for ideation, the free-ideation group had a small advantage. Because the free ideation group did not have to read and learn any framework before they started to ideate, they had more time within the 20 minutes to ideate. This extra time is an advantage for the free ideation group. When we constructed the experiment, we considered if the free ideation group should have less time than the other two experiment groups. Another alternative would be to give the case to the two experiment groups after they had read about their framework and give them 20 minutes from that time so that the time would be equal for the groups with and without a framework. We chose not to construct our experiment in this way because it is not not obvious that it is the right way. In reality the users of the frameworks will have to learn about the frameworks, thus it is natural that they start at the same time.
However, the fact that we did not let the participants read about the frameworks first and then gave them 20 minutes, can have weakened the internal validity of our study.

8.1.2.3 External validity

External validity refers to the generalizability of the results, and whether the sample is representative of the population. For the sample to be sufficiently representative of the population, the sample size must be large enough, randomly selected, and all members of the population must have had the same probability of being in the sample (Saunders et al., 2016).

We recruited 105 self-selected participants by using students who were present at the school at the given afternoons of the experiment as our sample. Thus, all members of the population did not have the same chance of being selected, and we have suffered a certain selection bias in our sampling. Our sample might represent an overweight of students that often stay late at school, or an overweight of students who respond well to incentivized participation. This negatively affects the degree to which our sample is representative of the population and limits the degree we can generalize to the population (Frankfort-Nachmias & Nachmias, 2008).

Even though we conducted the experiment using NHH students, we argue that our findings has relevance beyond our population, and that the results are relevant for decision-makers in both the public and private business sector. According to the Job Market Survey conducted yearly by NHH, 88,1 % of NHH graduates from 2017 are employed within 6 months of graduation. Of those 88,1 %, 93,2 % are working within private sector (NHH, 2018). Following this rationale, most of the participants from our study will be professionals in the private sector shortly after their graduation. Consequently, our findings have relevance for both *new venture entrepreneurs* and c*orporate entrepreneurs* in the private and public sector.

8.1.2.4 Statistical conclusion validity

Statistical conclusion validity concerns if we have done the statistical groundwork to conclude. In this thesis, we have used ANOVA, MANOVA, and t-tests as statistical methods. We tested our randomization for the experiment in 5.11.1 and found that the randomization was successful. In 5.11.2 we tested the assumptions necessary for conducting the MANOVA and found some minor weaknesses for the premises, but in total we have met the requirements at a satisfactory level. By meeting the MANOVA assumptions we have also met the assumption for ANOVA and t-tests. Based on these statistical methods and the assumption testing we have conducted, we consider our statistical conclusion validity to be met at a satisfactory level.

8.1.2.5 Construct validity

Convergent validity

To establish convergent validity we need to show that the measures that should be related, are in reality related. Concerning our convergent validity we had only only one question to the rater for each of the five dependent variables that were rated. Normally, we would measure these variables with two or more questions for each variable. However, because of the nature of this study it was not possible to have more than one question for each variable. If the business developer would have to rate all the 674 innovation ideas by answering ten questions instead of five, the workload would increase substantially. As a consequence, we used a single item measure in our experiment as a necessary limitation.

Discriminant validity

To establish discriminant validity we need to show that the dependent variables that should not be the same, are in reality different from each other. To evaluate the discriminant validity

in our experiment we can look at the correlation matrix for the dependent variables. From the correlation matrix in appendix 11.3.6 and the figure 5.5 in chapter 5.11.2 we can look at the correlations between the dependent variables. We observe that several of the variables have correlation between 0,66 - 0,9. The strong correlation between the variables implies that the variables are related and for some of them it is on the border to breaking the discriminant validity.

Based on the convergent and discriminant validity we consider our *construct validity* to be met at satisfactory level. For further studies, the researchers should look for a way to improve the convergent validity by adding more items to measure each construct. In our case there would need to between two to three items measuring each of the five dependent variables that were rated.

8.1.2.6 Reliability

Reliability refers to the consistency of the data material, and we can distinguish between internal and external reliability. Internal reliability relates to the consistency during the time horizon and setting of the research project. External reliability concerns whether the data collection methods and analysis would produce consistent findings if the research was repeated on another occasion, or if a different researcher replicated them (Saunders et al., 2016). Potential threats to reliability in our experiment include participant bias, researcher bias, participant errors, and researcher errors.

To reduce the participant and researcher bias in our experiment we had clear rules from the start of the experiment. During the experiment phase we did not communicate any of our expectations to the participants or other students at the school. The only explanation we gave the students was the written explanation given through the three information packages as shown in appendix 11.2.2-11.2.4. Thus, we made sure that we did not influence any events or mediate the effect of the independent variable in the experiment (Gill & Johnson, 2010). Measurement artifacts occur when measurement procedures provide the participants with hints about the purpose of the study or otherwise influence their responses. In terms of this bias, our participants might derive from the survey questions what the purpose of the study was. However, they answered the survey after submitting their ideas, thus the probability that we experienced measurement artifacts bias in our experiment is considered low.

Human errors can also occur, both from the participants' and the researchers' side. For instance, we noticed that some of the participants filled in the survey incorrectly or incompletely. Thus, we tried to make sure the rest of the participants filled out the survey correctly and fully. Researcher error can be caused by different types of human errors in the measurement and analysis. For example, when conducting the experiment, we had to make sure all participants used exactly 20 minutes to answer the case. We strived to keep all the participants within the time frame, and managed it very well because we had one person responsible for recruiting participants, and one responsible for keeping track of the time.

The fact that we only had one rater that rated the innovation ideas on a 7-point scale is a critical point for our reliability. Because we only had one rater we could not measure the reliability of the ratings. This is a limitation that should be addressed in further research.

8.2 Further research

The limitations in our experimental design can be viewed as opportunities for future research by other scholars. We would suggest future scholars conduct a field experiment with a longitudinal time horizon where they let companies from different industries use BM frameworks as a part of their innovation practice over an extended period of time. In order to achieve comparable results, each company could use several frameworks, to see which framework yields the best results. If such a study was conducted, we believe the results would be of high interest and relevance, and they could attract several interested parties from the business sector.

In further studies scholars should increase the reliability by having two or three professional business developers rating the innovation ideas. A limitation to our study was that we only had one professional business developer to rate our ideas, thus we could not measure the reliability of our ratings. When scholars attempt to do this in the further research, it will be important to establish a common understanding for how to rate the ideas. Our rating guide provided in this thesis can be used, but it should be expanded with two to three items measuring each variable, and some example ratings to ensure that the raters would have a common understanding of how to rate the ideas.

To increase the internal validity in further studies scholars should consider to let the groups with frameworks read the frameworks before they start the time for the idea generation. This

implies that the first thing the participants will do is to read how the BM frameworks work in detail, before they get the experiment scenario, the time is started and they start to generate innovation ideas. This will serve to make the conditions for the experiment more equal, thus it will strengthen the internal validity.

In further studies the scholars should consider several combinations of ways to generate innovation ideas that could yield better results. We have suggested that the participants combine the BMC and the Ten Types of Innovation. Our suggestion is that the participants start by mapping the current Business model of the company and locate the where to problem is. By using the BMC the implementability of the innovation ideas should score higher. To increase the *originality* and *priority* of the idea we suggest that the participants use the map we provided demonstrating which innovation type belongs in each building block of the BMC. Thereafter, the participants should use the innovation tactics from the Ten Types of innovation to generate innovation ideas for that specific building block.

In our analysis of moderating variables we found that experience with the Ten Types framework was a moderating variable for the *effectiveness* of the ideas produced with the Ten Types framework. We know from the descriptive statistics of the experiment that the Ten Types framework scored very high on *effectiveness*, even though the participants experience with the Ten Types framework, was one point on average lower than for the BMC framework. Therefore, we suggest that scholars replicate the experiment with an experiment group that gets trained on how to use the Ten Types framework so that the experience with the framework is equal to the experience with the BMC framework. If the experience is equal for the two framework we think that the effectiveness will also be significantly higher for the Ten Types framework. Thus, the Ten Type framework can contribute with higher *originality*, *effectiveness*, and *priority*, when combined with the BMC framework. This is a suggestion that scholars will have to test in further research.

Our research has been conducted on an individual level. In our comparison of the frameworks we have suggested that the BMC framework should be particularly useful for facilitating teamwork because of the visual design and logic of the framework. This creates the question if the results would have been different if the experiment was repeated with teams. We speculate if the synergy effects can be even higher if the study is repeated with teams, as the innovation ideas from the Ten Types framework can be plotted in the BMC

and discussed in teams after both frameworks have been used. This would suggest the following structure of the ideation session, 1) Plot the BMC and locate the problem, 2) Ideate with the Ten Types framework, and 3) Plot the new ideas from the Ten Types ideation and discuss them in teams to see how they fit and how they can be adapted. If the scholars repeat the study with teams they will have to make a decision if they should use brainstorming or brainwriting to facilitate the teamwork. We have covered this in our literature review and suggest that the scholars use brainwriting to avoid production blocking. If scholars conduct the experiment with teams, we recommend that they have an external consultant that does not know the details of the experiment and can lead the idea generation sessions. In our literature review we have discussed how leaders of teams are critical for their outcome, thus if the experiment was repeated with different leaders in each team, the results might not be very reliable.

When we plotted all the 674 ideas and looked at the count of ideas for each framework on each score we observed that the free-ideation group had more extreme scores (7) on *originality*, than any of the other groups. This shows that we can not completely forget about free ideation. We therefore suggest that scholars who intend to replicate our study, find a way to incorporate free ideation in the study to see how it affects the originality. We see a potential in using the free ideation method together with brainwriting, before the ten types framework is used, but after the problem is located by using the BMC framework.

In our study we did analyze the content of the innovation ideas. This is an critical point because in practice, the companies would want to know the different content of the ideas and not only the scores. We cannot say if the methods produced different innovation ideas purely content wise. This is absolutely an important point for further research. Through this thesis, we have unveiled theoretical and principal differences between the frameworks. If this study would be conducted the seafood industry, the researchers would have looked closer at the content of the ideas. However, this thesis has been conducted on a principal level.

9 Concluding remarks

In this chapter we will gather the information we have generated in this thesis, to make a concluding remark and attempt to answer the research question.

The purpose of this thesis has been to investigate how the use of different business model frameworks can help to generate better innovation ideas. After reviewing the literature, we decided to continue our research focusing on the BMC and Doblin's Ten Types of innovation frameworks. Based on the purpose of our thesis and a brief review of the literature, we developed the following research question:

What is the effect of using the Business Model Canvas and Doblin's Ten Types of Innovation as idea generation tools on the quantity, creativity, and value of innovation ideas produced to solve a business case?

We developed nine research hypotheses that we addressed by conducting an experiment. In the experiment, the participants were asked to generate ideas to solve a fictive case using the BMC, Ten Types framework or no framework. From the analysis of the experiment results, we found that one of the nine hypotheses was statistically significant. The results revealed that the Ten Types framework was significantly better at generating innovation ideas that scored high on *originality* and *priority*. *Originality* was the only creativity dimension with significant results. The *priority* dimension shows how valuable the ideas are, thus the Ten Types framework produced significantly more valuable ideas than the BMC. In additional results, we found that the experience with the Ten Types framework was a moderating variable for the *effectiveness* of the innovation ideas produced with the Ten Types framework.

Our findings are positive towards including the Ten Types of Innovation framework in further research, and can serve as a reminder that the framework has been neglected in academic research. We found indications of several other effects from using the two frameworks that were not statistically significant. From the results we have seen that the BMC produced ideas that had a particularly high score on *implementability*. For quantity of ideas, the Ten Types framework produces the highest average per participant, with the free

ideation group producing the second highest, and the BMC group producing the lowest. The statistical groundwork and the assumption testing for the methods used in this thesis, show that the assumptions for the methods used in this thesis, have been met at a satisfactory level.

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11 Appendix

11.1 List of frameworks

BM	Author (year)	Components	Source
1	Timmers (1998)	Product/service/information flow architecture, business actors and roles, actor benefits, revenue sources, and marketing strategy	Morris, Schindehutte & Allen (2005)
2	Markides (1999)	Product innovation, customer relationship, infrastructure management, and financial aspects	Morris, Schindehutte & Allen (2015)
3	Hamel (2000)	Core Strategy, strategic resources, value network, customer Interface	B.W. Wirtz et al (2016)
	Mahadevan (2000)	Logistic Stream, value Stream, revenue Stream	B.W. Wirtz et al (2016)
5	Chesbrough and Rosenbaum (2000)	Value proposition, target markets, internal value chain structure, cost structure and profit model, value network, and competitive strategy	Morris, Schindehutte & Allen (2005)
6	Gordijn et al. (2001)	Actors, market segments, value offering, value activity, stakeholder network, value interfaces, value ports, and value exchanges	Morris, Schindehutte & Allen (2005)
7	Linder and Cantrell (2001)	Pricing model, revenue model, channel model, commerce process model, internet-enabled commerce relationship, organizational form, and value proposition	Morris. Schindehutte & Allen (2005)
8	Petrovic et al. (2001)	Value model, resource model, production model, customer relations model, revenue model, capital model and market model	Morris, Schindehutte & Allen (2005)
9	Dubosson-Torbay et al. (2001)	Products, customer relationships, infrastructure and network of partners, and financial aspects	Morris, Schindehutte & Allen (2005)

10	Rayport and Jaworski (2001)	Value cluster, market space offering, resource system and financial model	Morris, Schindehutte & Allen (2005)
11	Deloitte (2002)	Who, what, and how, internal capabilities, external factors	Wirtz & Daiser (2017)
12	Wirtz (2002)	Combination of production factors for strategy implementation, core competencies & core assets, market & customer segmentation, service ofer & value proposition, systematization of value forms, combination & transformation of goods & services, production factors & suppliers, financing and refinancing	B.W Wirtz et al (2016)
13	Hedman and Kalling (2002)	Managerial and organizational, longitudinal process component, resources, customers, competitors, offering, activities & organization, factor & production input suppliers	B.W Wirtz et al (2016)
14	Gartner (2003)	Market offering, competencies, core technology, investments and bottom line	Morris, Schindehutte & Allen (2005)
15	Bouwman (2003)	Technical architecture, customer value of service & financial arrangements.	B.W Wirtz et al (2016)
16	Afuah (2004)	Positions, resources, industry factors, activities & costs	B.W Wirtz et al (2016)
17	Yip (2004)	Scope, differentiation, organization, nature of customers, channels, value proposition, nature of outputs, how to transform inputs (including technology), nature of inputs	B.W Wirtz et al (2016)
18	Mahadevan (2004)	Technology, regulatory and economy, changing customer needs, competition, firm level issues, target customers, value propositions, value delivery system	Wirtz & Daiser (2017)
19	Voelpel et al. (2004)	Customers, technology, business system infrastructure, and economics/profitability	Wirtz & Daiser (2017)
20	Morris et al (2005)	Factors related to the offering, market factors, internal capability factors, competitive strategy factors, economic factors, personal/investor factors	Morri, Schindehutte & Allen (2005)

21	Tikkanen et al. (2005)	Strategy & structure, network, operations, finance & accounting	B.W Wirtz et al (2016)
22	Osterwalder, Pigneur & Tucci (2005)	Core competency, partner network, target customer, distribution channel, relationship, value proposition, revenue model, value configuration, cost structure	B.W Wirtz et al (2016)
23	Lehmann-Ortega & Schoetti (2005)	Value proposition, value architecture & revenue model	B.W Wirtz et al (2016)
24	Al-Debel, El Haddadeh & Avison (2008)	Value network, value propositions, value architecture, value finance	B.W Wirtz et al (2016)
25	IBM (2009)	Industry model innovation - innovating the industry value chain, revenue model innovation - product, service, and/or value development, as well as novel pricing models, and enterprise model innovation - Innovating by changing enterprises, partner, and/or networks	Wirtz & Daiser (2017)
26	Demil & Lecocq (2010)	Resources and competences, organization, value proposition, volume & structure of revenue streams, volume and structure of revenue costs	B.W Wirtz et al (2016)
27	Johnson (2010)	Key resources, customer value proposition, profit formula, key processes	B.W Wirtz et al (2016)
28	Osterwalder & Pigneur (2010)	Key resources, key partners, customer relationships, channels, customer segment, value proposition, revenue streams, key activities, cost structure	B.W Wirtz et al (2016)
29	Yang et al. (2014)	Competency, market, product, cost, who, what how	Wirtz & Daiser (2017)
30	Wirtz & Daiser (2017)	Target group/customers, value proposition, value constellation.	Wirtz & Daiser (2017)

11.2 Experiment material

11.2.1 Experiment scenario

Real Salmon ASA

The salmon producer Real Salmon is located in Øygarden outside of Bergen and produces salmon for the international market. Currently, Real Salmon sells their salmon for the spot price in the market. The company experience big fluctuations in profitability. Over the last two years, the price has fallen several times. In addition, their production costs have been rising steadily in last years. When the salmon price drops and approaches 40 NOK/KG, it can barely cover the production cost. The average price from 2017 and the first weeks of 2018 can be seen in the figure below, together with the production cost in 2017, and the projected production cost for 2018.

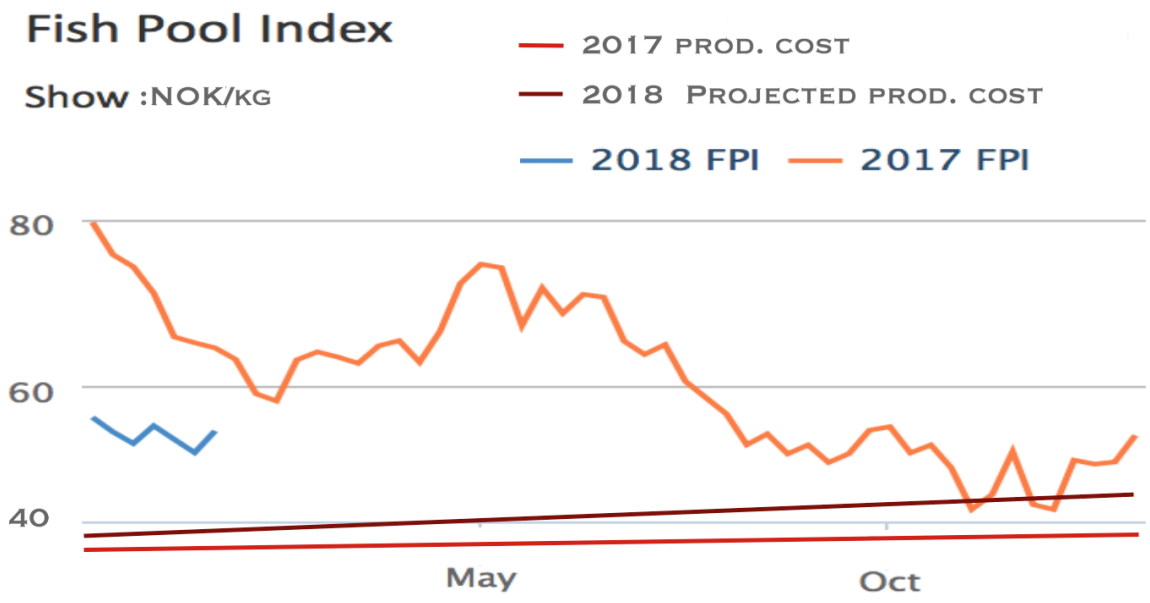


Figure 11.1 - The Norwegian salmon prices (Adapted from Fish Pool Index, 2018)

In the years to come, the production cost is expected to rise further, and the spot price is expected to fall as a result of increased supply. The increasing production costs and falling prices are serious threats to Real Salmon's future profitability.

Imagine that you are an external innovation consultant, and that Real Salmon is now reaching out to you to help them in this situation. You have been provided with the following additional information:

- Real Salmon has established a partnership with Fjord Seafood, which takes care of their sales function
- Real Salmon has their own production facility
- The company's most important resource is their long experience in salmon farming, which makes it possible to deliver the company's value proposition
- Real Salmon's value proposition is to deliver high quality salmon in a cost-efficient way

Given this information, you are asked to help Real Salmon innovate to keep their company running profitably in the future. Please provide some ideas to make the company do better in a situation with higher costs and lower prices. Feel free to use the internet to help you when solving the case. Note that there are no right or wrong answer to this case, please write down as many ideas as possible on the next pages.

11.2.2 Information package - Experiment group with BMC

Idea generation study

Dear participant,

Thank you for deciding to participate in this study. You have been given the Business Model Canvas as a tool to aid you when generating new ideas. Please read the innovation case and keep it in mind when reading the instructions on the following page.

Note that you only have 20 minutes to read the information and write down your ideas. When you are close to the end we will tell you to stop generating business ideas and wrap up. Ask us for help if something is unclear.

Generating ideas with the Business Model Canvas

The Business Model Canvas framework is used as a tool to analyze business models and generate new ideas. The framework consists of nine building blocks that are mapped out as boxes on a canvas. The building blocks explain and visualize how a company intends to create, deliver, and capture value. We have provided the Business Model Canvas on **page 5**, please follow the instructions and ask if something is unclear.

Instructions:

1. Look at the innovation case on the previous pages and do your best to write down the *current* business model of Real Salmon in the Business Model Canvas.

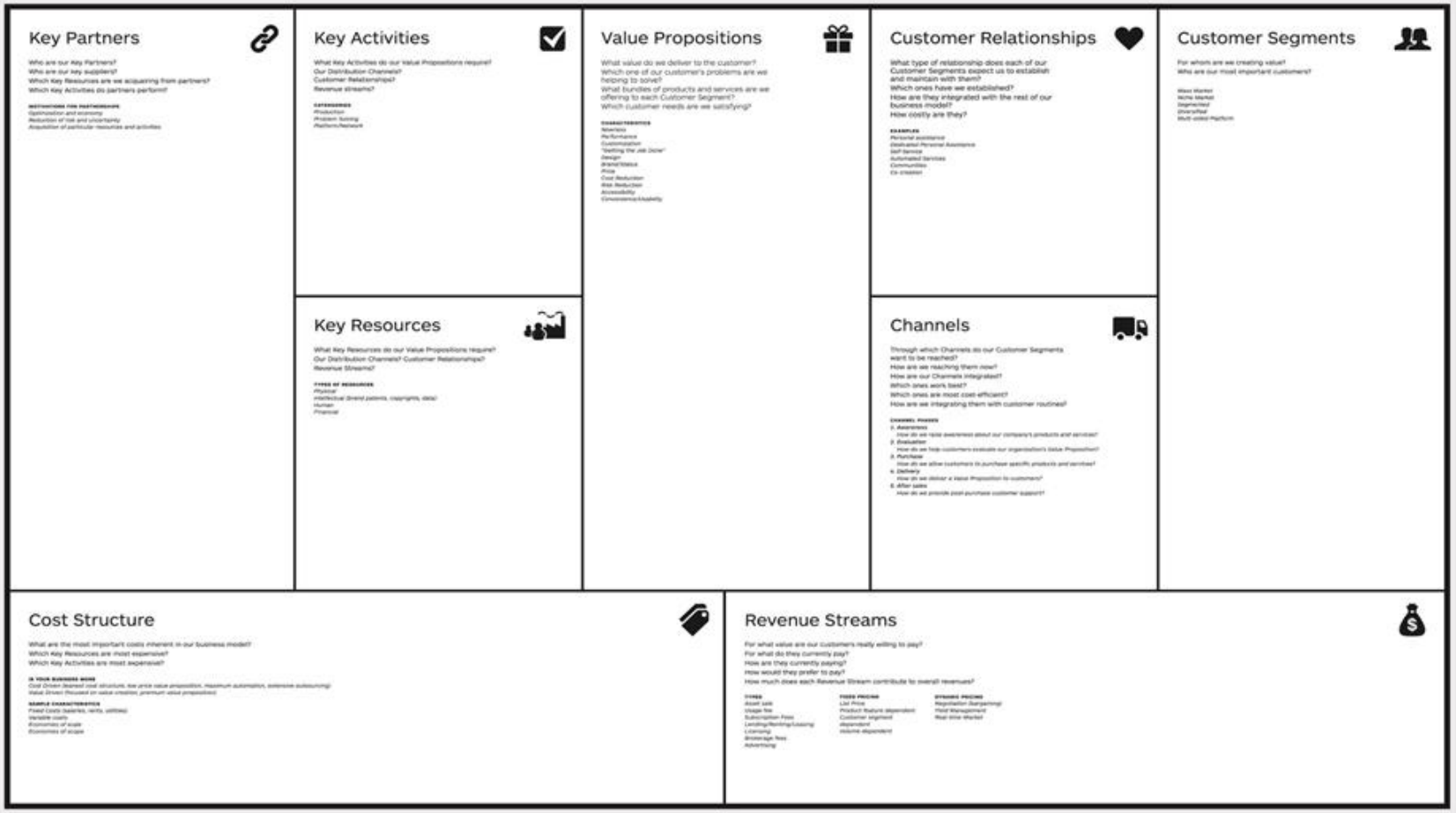
2. Try to generate ideas that could help the Real Salmon by using the Business Model Canvas and write down your ideas on **page 6-7**.

You can choose to do this completely freely, **or** by using the following strategy:

a) Look at each of the building blocks in the canvas provided below and try to think of new ideas to solve the case by asking "what if", "what else", and "what other" questions within each building block. Example: "*what else* could the resources or value proposition be used for?", "*what else* could the customers want?", "*what other* jobs could be done with this channel?"

The Business Model Canvas

Designed for:	Designed by:	Date:	Version:



Strategyzer
strategyzer.com

11.2.3 Information package - Experiment group with Ten Types

Idea generation study

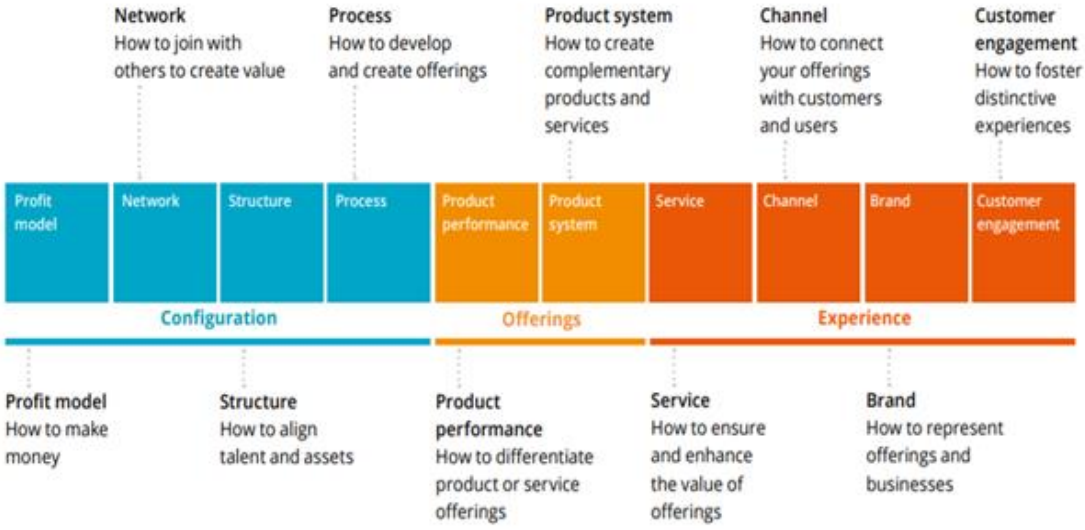
Dear participant,

Thank you for deciding to participate in this study. You have been given the Ten Types of Innovation as a tool to aid you when generating new ideas. Please read the innovation case and keep it in mind when reading the instructions on the following page.

Note that you only have 20 minutes to read the information and write down your ideas. When you are close to the end we will tell you to stop generating business ideas and wrap up. Ask us for help if something is unclear.

Generating ideas with The Ten Types of Innovation

The Ten Types of Innovation works as a checklist where you are challenged to innovate more broadly by focusing on several different types of innovations. This is often a great tool to avoid an excessive focus on product innovation. An innovation can be made within a) the configuration of the profit model, network, structure, or processes b) offering that is provided in the form of a product performance or product system innovation, or within c) experience in the form of service, channel, brand, or customer engagement innovation.



Instructions:

1. Look at the innovation case on the previous pages and try to think of how Real Salmon can innovate within any of the Ten Types of Innovation. Write down as many ideas as possible.

2. Feel free to use the overview of innovation examples provided on **the next page** to generate ideas (Innovation tactics, Keeley et al., 2013).

DOBLIN

TEN TYPES OF INNOVATION

TACTICS OVERVIEW

Profit Model

Premium
Price at a higher margin than competitors, usually for a superior product, offering, experience, service or brand.

Cost Leadership
Keep variable costs low and sell high volumes at low prices.

Scaled Transactions
Maximize margins by pursuing high volume, large scale transactions when unit costs are relatively fixed.

Microtransactions
Sell many items for as little as a dollar—or even only one cent—to drive impulse purchases at volume.

Forced Scarcity
Limit the supply of offerings available, by quantity, time frame or access, to drive up demand and/or prices.

Subscription
Create predictable cash flows by charging customers up front (a one time or recurring fee) to have access to the product/service over time.

Membership
Charge a time-based payment to permit access to locations, offerings, or services that non-members don't have.

Installed Base
Offer a "core" product for slim margins (or even a loss) to drive demand and loyalty; then realize profit on additional products and services.

Switchboard
Connect multiple sellers with multiple buyers; the more buyers and sellers who join, the more valuable the switchboard.

Auction
Allow a market—and its users—to set the price for goods and services.

User-Defined
Invite customers to set a price they wish to pay.

Freemium
Offer basic services for free, while charging a premium for advanced or special features.

Flexible Pricing
Vary prices for an offering based on demand.

Float
Receive payment prior to building the offering—and use the cash to earn interest prior to making margins.

Financing
Capture revenue not directly from the sale of a product, but from structured payment plans and after-sale interest.

Ad-Supported
Provide content/services for free to one party while selling listeners, viewers or "eyeballs" to another party.

Licensing
Grant permission to some other group or individual to use your offering in a defined way for a specified payment.

Metered Use
Allow customers to pay for only what they use.

Bundled Pricing
Sell in a single transaction two or more items that could be sold as standalone offerings.

Disaggregate Pricing
Allow customers to buy exactly—and only—what they want.

Risk Sharing
Waive standard fees/costs if certain metrics aren't achieved, but receive outsize gains when they are.

Network

Merger/Acquisition
Combine two or more entities to gain access to capabilities and assets.

Consolidation
Acquire multiple companies in the same market or complementary markets.

Open Innovation
Obtain access to processes or patents from other companies to leverage, extend, and build on expertise and/or do the same with internal IP and processes.

Secondary Markets
Connect waste streams, by-products, or other alternative offerings to those who want them.

Supply Chain Integration
Coordinate and integrate information and/or processes across a company or functions of the supply chain.

Complementary Partnering
Leverage assets by sharing them with companies that serve similar markets but offer different products and services.

Alliances
Share risks and revenues to jointly improve individual competitive advantage.

Franchising
License business principles, processes, and brand to paying partners.

Coopetition
Join forces with someone who would normally be your competitor to achieve a common goal.

Collaboration
Partner with others for mutual benefit.

Structure

Organizational Design
Make form follow function and align infrastructure with core qualities and business processes.

Incentive Systems
Offer rewards (financial or non-financial) to provide motivation for a particular course of action.

IT Integration
Integrate technology resources and applications.

Competency Center
Cluster resources, practices and expertise into support centers that increase efficiency and effectiveness across the broader organization.

Outsourcing
Assign responsibility for developing or maintaining a system to a vendor.

Corporate University
Provide job-specific or company-specific training for managers.

Decentralized Management
Distribute decision-making governance closer to the customer or other key business interfaces.

Knowledge Management
Share relevant information internally to reduce redundancy and improve job performance.

Asset Standardization
Reduce operating costs and increase connectivity and modularity by standardizing your assets.

Process

Process Standardization
Use common products, processes, procedures, and policies to reduce complexity, costs, and errors.

Localization
Adapt an offering, process, or experience to target a culture or region.

Process Efficiency
Create or produce more while using fewer resources—measured in materials, energy consumption or time.

Flexible Manufacturing
Use a production system that can rapidly react to changes and still operate efficiently.

Process Automation
Apply tools and infrastructure to manage routine activities in order to free up employees.

Crowdsourcing
Outsource repetitive or challenging work to a large group of semi-organized individuals.

On-Demand Production
Produce items after an order has been received to avoid carrying costs of inventory.

Lean Production
Reduce waste and cost in your manufacturing process and other operations.

Logistics Systems
Manage the flow of goods, information and other resources between the point of origin and the point of use.

Strategic Design
Employ a purposeful approach that manifests itself consistently across offerings, brands, and experiences.

Intellectual Property
Protect an idea that has commercial value—such as a recipe or industrial process—with legal tools like patents.

User Generated
Put your users to work in creating and curating content that powers your offerings.

Predictive Analytics
Model past performance data and predict future outcomes to design and price offerings accordingly.

Product Performance

Superior Product
Develop an offering of exceptional design, quality, and/or experience.

Ease of Use
Make your product simple, intuitive and comfortable to use.

Engaging Functionality
Provide an unexpected or newsworthy experiential component that elevates the customer interaction.

Safety
Increase the customer's level of confidence and security.

Feature Aggregation
Combine existing features found across offerings into a single offering.

Added Functionality
Add new functionality to an existing offering.

Performance Simplification
Omit superfluous details, features, and interactions to reduce complexity.

Environmental Sensitivity
Provide offerings that do no harm—or relatively less harm—to the environment.

Conservation
Design your product so that customers can reduce their use of energy or materials.

Customization
Enable altering of the product or service to suit individual requirements or specifications.

Focus
Design an offering specifically for a particular audience at the expense of others.

Styling
Impart a style, fashion or image.

Product System

Complements
Sell additional related or ancillary products or services to a customer.

Extensions/Plug-ins
Allow first- or third-party additions that add functionality.

Product Bundling
Offer several products for sale as one combined product.

Modular Systems
Provide a set of individual components that can be used independently, but gain utility when combined.

Product/Service Platforms
Develop systems that connect with other, partner products and services to create a holistic offering.

Integrated Offering
Combine otherwise discrete components into a complete experience.

Service

Try Before You Buy
Let customers test and experience an offering before investing in it.

Guarantee
Remove customer risk of lost money or time stemming from product failure or purchase error.

Loyalty Programs
Provide benefits and/or discounts to frequent and high-value customers.

Added Value
Include an additional service/function as part of the base price.

Concierge
Provide premium service by taking on tasks for which customers don't have time.

Total Experience Management
Provide thoughtful, holistic management of the consumer experience across an offering's lifecycle.

Supplementary Service
Offer ancillary services that fit with your offering.

Superior Service
Provide service(s) of higher quality, efficacy, or with a better experience than any competitor.

Personalized Service
Use the customer's own information to provide perfectly calibrated service.

User Communities/ Support Systems
Provide a communal resource for product/service support, use and extension.

Lease or Loan
Let customers pay over time to lower upfront costs.

Self-Service
Provide users with control over activities that would otherwise require an intermediary to complete.

Channel

Diversification
Add and expand into new or different channels.

Flagship Store
Create a store to showcase quintessential brand and product attributes.

Go Direct
Skip traditional retail channels and connect directly with customers.

Non-Traditional Channels
Employ novel and relevant avenues to reach customers.

Pop-up Presence
Create a noteworthy but temporary environment to showcase and/or sell offerings.

Indirect Distribution
Use others as resellers who take ownership over delivering the offering to the final user.

Multi-Level Marketing
Sell bulk or packaged goods to an affiliated but independent sales force that turns around and sells it for you.

Cross-selling
Place products, services, or information that will enhance an experience in situations where customers are likely to want to access them.

On-Demand
Deliver goods in real-time whenever or wherever they are desired.

Context Specific
Offer timely access to goods that are appropriate for a specific location, occasion, or situation.

Experience Center
Create a space that encourages your customers to interact with your offerings—but purchase them through a different (and often lower-cost) channel.

Brand

Co-Branding
Combine brands to mutually reinforce key attributes or enhance the credibility of an offering.

Brand Leverage
"Lend" your credibility and allow others to use your name—thus extending your brand's reach.

Private Label
Provide goods made by others under your company's brand.

Brand Extension
Offer a new product or service under the umbrella of an existing brand.

Component Branding
Brand an integral component to make a final offering appear more valuable.

Transparency
Let customers see into your operations and participate with your brand and offerings.

Values Alignment
Make your brand stand for a big idea or a set of values and express them consistently in all aspects of your company.

Certification
Develop a brand or mark that signifies and ensures certain characteristics in third-party offerings.

Customer Engagement

Process Automation
Remove the burden of repetitive tasks from the user to simplify life and make new experiences seem magical.

Experience Simplification
Reduce complexity and focus on delivering specific experiences exceptionally well.

Curation
Use a distinct point of view to separate the proverbial wheat from the chaff—and in the process create a strong identity for yourself and your followers.

Experience Enabling
Extend the realm of what's possible to offer a previously improbable experience.

Mastery
Help customers to obtain great skill or deep knowledge of some activity or subject.

Autonomy and Authority
Grant users the power to use your offerings to shape their own experience.

Community and Belonging
Facilitate visceral connections to make people feel they are part of a group or movement.

Personalization
Alter a standard offering to allow the projection of the customer's identity.

Whimsy and Personality
Humanize your offering with small flourishes of on-brand, on-message ways of seeming alive.

Status and Recognition
Offer cues that infer meaning, allowing users—and those who interact with them—to develop and nurture aspects of their identity.

CONFIGURATION

OFFERING

EXPERIENCE

11.2.4 Information package - Experiment group with free ideation

Idea generation study

Dear participant,

Thank you for deciding to participate in this study. Please read the innovation case on the next page.

Note that you only have 20 minutes to read the information and write down your ideas. When you are close to the end we will tell you to stop generating business ideas and wrap up. Ask us for help if something is unclear.

11.2.5 Post experiment survey

Survey

Age: **University:**
Gender: **Current year of study (1-5):**

	Please circle your answer		**Please only circle the numbers**						
1	How much **experience** do you have with **generating business ideas**?	None	1	2	3	4	5	6	Very much
2	How much **experience** do you have with using the **Business Model Canvas framework**?	None	1	2	3	4	5	6	Very much
3	How much **experience** do you have with using the **Ten Types of Innovation framework**?	None	1	2	3	4	5	6	Very much
4	Did you find it difficult to generate ideas?	Not at all	1	2	3	4	5	6	Very much
5	How creative do you think your ideas were?	Not at all	1	2	3	4	5	6	Very much
6	How valuable do you think your ideas were?	Not at all	1	2	3	4	5	6	Very much
7	What do you think the purpose of the study was?								
8	Do you have any other comments?								

11.2.6 Rating guide for expert panel

Dear expert panel,
Thank you for extending your vital help to this project. The task we need help with is to rate the innovation ideas generated to solve the experiment case provided.

On the next page we have provided a brief rating guide.

The ideas must be rated individually, which means that if you are three raters, each idea will be rated three times, in three different excel sheets with no communication between the raters.

We will come to your office present at the rating day and be present in case you have any questions.

We kindly ask you to rate each individual idea on a scale from 1 to 7 on the following dimensions:

Originality:

To which degree is the idea not only rare, but clever, imaginative and surprising?

1= Not original at all, 7 = Very original

Implementability:

To which degree can the idea be easily implemented?

1= Not implementable at all, 7 = Very implementable

Applicability:

To which degree does the idea clearly apply to the problem?

1 = Does not apply at all, 7 = Applies very much

Effectiveness:

To which degree is the idea effective at solving the problem?

1 = Not effective at all, 7 = Very effective

Priority:

To which degree would you prioritise this idea in the further work on the problem?

1= Not prioritized at all, 7 = Very prioritized

11.3 Data analysis

11.3.1 Descriptive statistics for dependent variables

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Originality * Group	105	100.0%	0	0.0%	105	100.0%
Implementability * Group	105	100.0%	0	0.0%	105	100.0%
Applicability * Group	105	100.0%	0	0.0%	105	100.0%
Effectiveness * Group	105	100.0%	0	0.0%	105	100.0%
Priority * Group	105	100.0%	0	0.0%	105	100.0%

Group		Originality	Implementability	Applicability	Effectiveness	Priority
1	Mean	4.3016667	4.6668367	4.3949660	4.1103061	4.0138435
	N	35	35	35	35	35
	Std. Deviation	.91494669	.79015315	.77055922	.86353669	.64600208
	Minimum	2.00000	2.00000	2.28571	2.28571	2.42857
	Maximum	6.25000	5.75000	6.00000	6.25000	6.12500
2	Mean	4.7789404	4.4788101	4.3831262	4.4384913	4.3305541
	N	35	35	35	35	35
	Std. Deviation	.60579712	.57754918	.49766981	.54489541	.41601552
	Minimum	3.33333	3.14286	3.16667	3.11111	3.33333
	Maximum	6.00000	5.45455	5.20000	5.20000	5.15385
3	Mean	4.7012925	4.6253288	4.3374717	4.2549660	4.2327211
	N	35	35	35	35	35
	Std. Deviation	.84662385	.63165591	.57582213	.60264727	.49090552
	Minimum	2.50000	3.00000	3.20000	3.00000	3.25000
	Maximum	6.00000	5.75000	5.37500	5.37500	5.25000
Total	Mean	4.5939665	4.5903252	4.3718546	4.2679212	4.1923729
	N	105	105	105	105	105
	Std. Deviation	.81983414	.67094527	.61976101	.69122613	.53804842
	Minimum	2.00000	2.00000	2.28571	2.28571	2.42857
	Maximum	6.25000	5.75000	6.00000	6.25000	6.12500

11.3.2 Descriptive statistics for survey variables

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Numberideas * Group	105	100.0%	0	0.0%	105	100.0%
Age * Group	105	100.0%	0	0.0%	105	100.0%
Year * Group	105	100.0%	0	0.0%	105	100.0%
Experience * Group	105	100.0%	0	0.0%	105	100.0%
ExperienceBMC * Group	105	100.0%	0	0.0%	105	100.0%
ExperienceTenT * Group	105	100.0%	0	0.0%	105	100.0%
PercievedDIF * Group	105	100.0%	0	0.0%	105	100.0%
PercivedCre * Group	105	100.0%	0	0.0%	105	100.0%
PercivedV * Group	105	100.0%	0	0.0%	105	100.0%

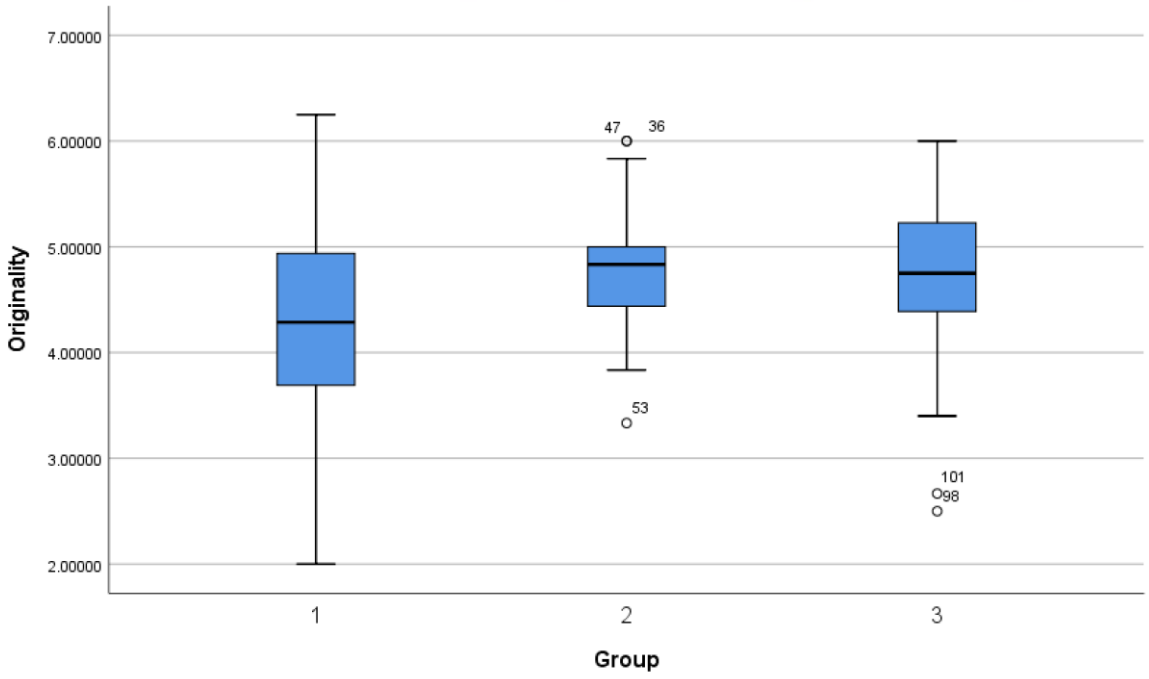
Report

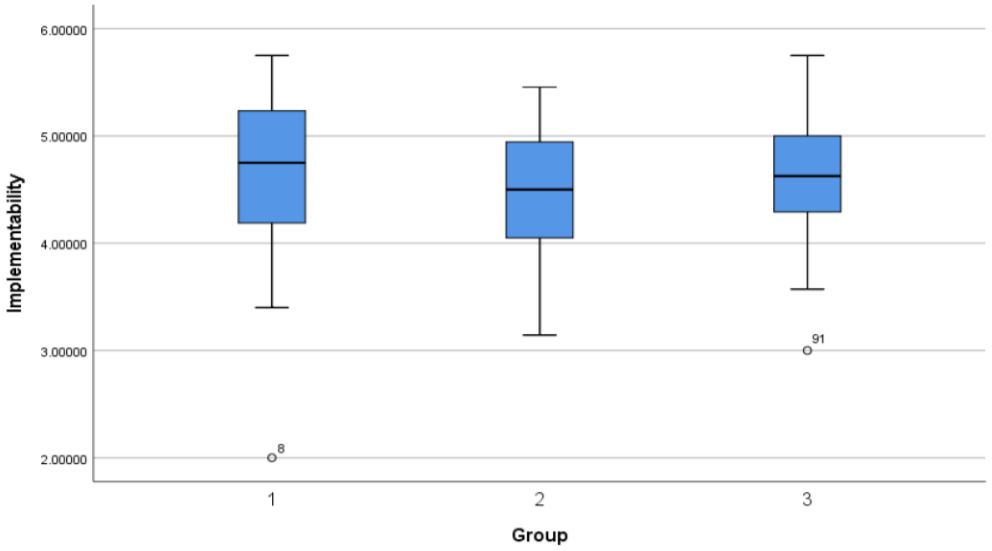
Group		Numberideas	Age	Year	Experience	ExperienceBMC	ExperienceTenT	PercievedDIF	PercivedCre	PercivedV
1	Mean	6.03	23.34	3.77	2.63	2.23	1.23	3.66	2.40	2.46
	N	35	35	35	35	35	35	35	35	35
	Std. Deviation	2.256	1.999	1.262	1.239	1.114	.598	1.474	1.006	1.221
	Minimum	2	19	1	1	1	1	1	1	1
	Maximum	11	30	5	5	4	4	6	4	6
	Std. Error of Mean	.381	.338	.213	.209	.188	.101	.249	.170	.206
2	Mean	6.91	24.43	3.63	2.17	1.97	1.23	3.77	2.51	3.03
	N	35	35	35	35	35	35	35	35	35
	Std. Deviation	2.381	3.146	1.239	1.124	1.599	.808	1.262	1.245	1.272
	Minimum	3	20	1	1	1	1	1	1	1
	Maximum	13	36	5	5	6	5	6	5	6
	Std. Error of Mean	.402	.532	.209	.190	.270	.136	.213	.211	.215
3	Mean	6.31	23.69	3.71	2.40	1.94	1.20	4.00	2.46	2.54
	N	35	35	35	35	35	35	35	35	35
	Std. Deviation	2.471	1.875	1.250	1.241	1.259	.584	1.306	1.268	1.172
	Minimum	2	19	1	1	1	1	1	1	1
	Maximum	12	28	5	5	5	4	6	6	6
	Std. Error of Mean	.418	.317	.211	.210	.213	.099	.221	.214	.198
Total	Mean	6.42	23.82	3.70	2.40	2.05	1.22	3.81	2.46	2.68
	N	105	105	105	105	105	105	105	105	105
	Std. Deviation	2.377	2.429	1.240	1.206	1.333	.665	1.345	1.169	1.236
	Minimum	2	19	1	1	1	1	1	1	1
	Maximum	13	36	5	5	6	5	6	6	6
	Std. Error of Mean	.232	.237	.121	.118	.130	.065	.131	.114	.121

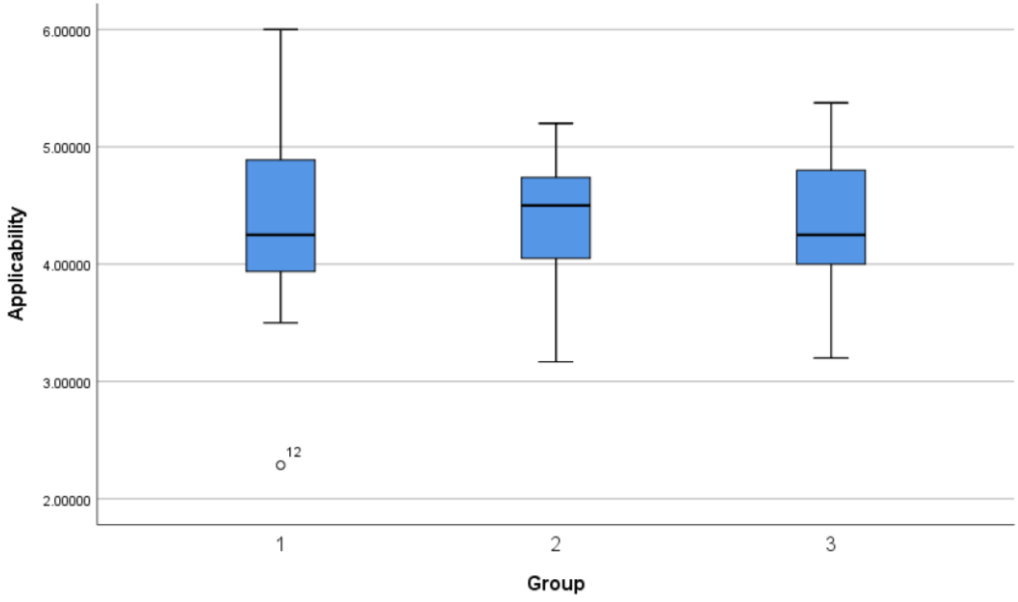
11.3.3 Box plots

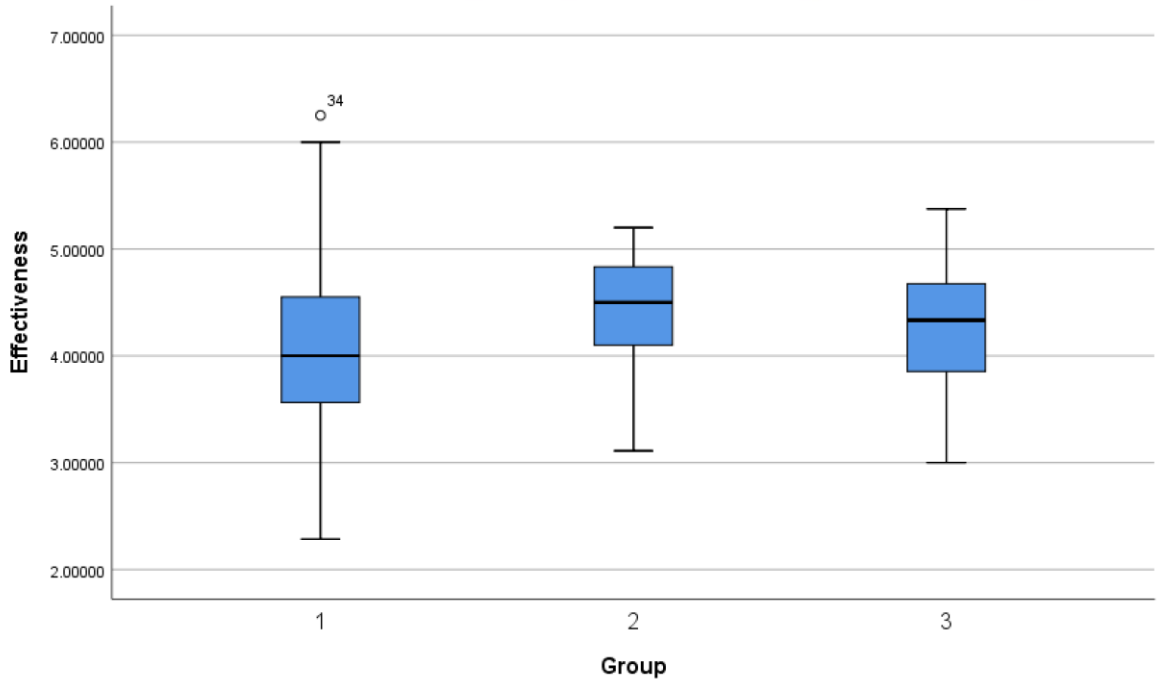
Case Processing Summary

	Group	Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
Originality	1	35	100.0%	0	0.0%	35	100.0%
	2	35	100.0%	0	0.0%	35	100.0%
	3	35	100.0%	0	0.0%	35	100.0%
Implementability	1	35	100.0%	0	0.0%	35	100.0%
	2	35	100.0%	0	0.0%	35	100.0%
	3	35	100.0%	0	0.0%	35	100.0%
Applicability	1	35	100.0%	0	0.0%	35	100.0%
	2	35	100.0%	0	0.0%	35	100.0%
	3	35	100.0%	0	0.0%	35	100.0%
Effectiveness	1	35	100.0%	0	0.0%	35	100.0%
	2	35	100.0%	0	0.0%	35	100.0%
	3	35	100.0%	0	0.0%	35	100.0%
Priority	1	35	100.0%	0	0.0%	35	100.0%
	2	35	100.0%	0	0.0%	35	100.0%
	3	35	100.0%	0	0.0%	35	100.0%




Implementability
6.00000
5.00000
4.00000
3.00000
2.00000
8
91
1
2
3
Group


Applicability
6.00000
5.00000
4.00000
3.00000
2.00000
12
1
2
3
Group


Effectiveness
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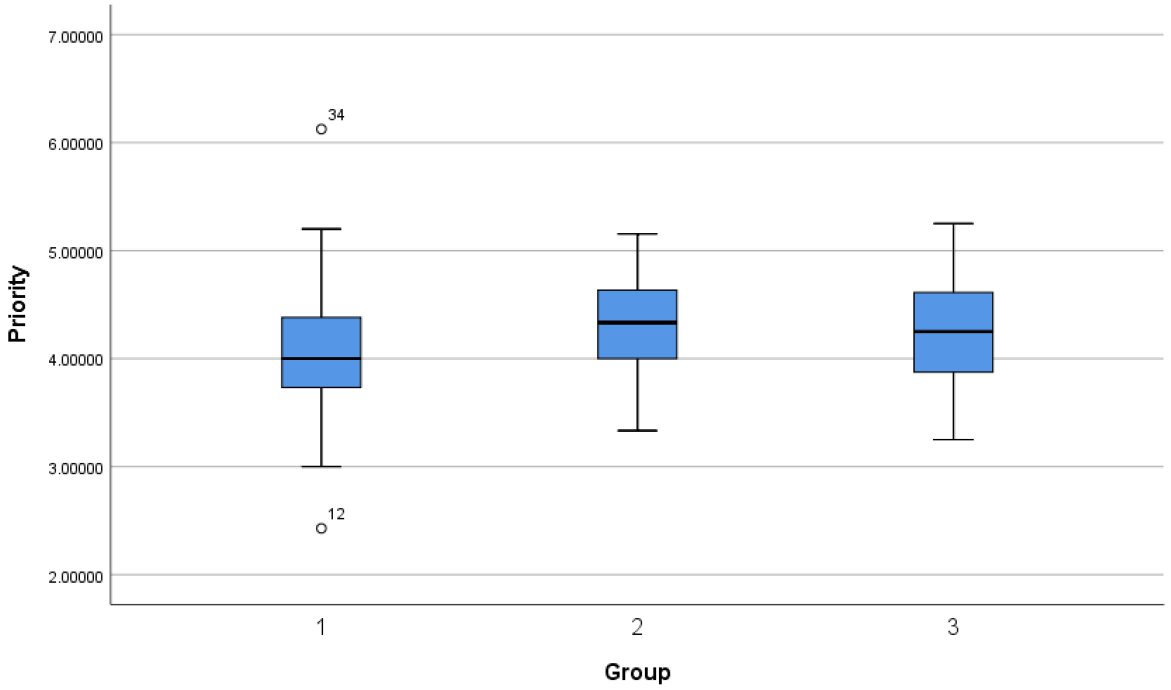
6.00000
5.00000
4.00000
3.00000
2.00000
34
1
2
3
Group


Priority
7.00000
6.00000
5.00000
4.00000
3.00000
2.00000
34
12
1
2
3
Group

11.3.5 Randomization test using one-way ANOVA

Descriptives

Gender

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	35	1.46	.505	.085	1.28	1.63	1	2
2	35	1.40	.497	.084	1.23	1.57	1	2
3	35	1.46	.505	.085	1.28	1.63	1	2
Total	105	1.44	.499	.049	1.34	1.53	1	2

ANOVA

Gender

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.076	2	.038	.151	.860
Within Groups	25.771	102	.253		
Total	25.848	104			

Descriptives

Age

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	35	23.34	1.999	.338	22.66	24.03	19	30
2	35	24.43	3.146	.532	23.35	25.51	20	36
3	35	23.69	1.875	.317	23.04	24.33	19	28
Total	105	23.82	2.429	.237	23.35	24.29	19	36

ANOVA

Age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	21.562	2	10.781	1.858	.161
Within Groups	592.000	102	5.804		
Total	613.562	104			

Descriptives

Year

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	35	3.77	1.262	.213	3.34	4.21	1	5
2	35	3.63	1.239	.209	3.20	4.05	1	5
3	35	3.71	1.250	.211	3.28	4.14	1	5
Total	105	3.70	1.240	.121	3.46	3.94	1	5

ANOVA

Year

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.362	2	.181	.116	.891
Within Groups	159.486	102	1.564		
Total	159.848	104			

Descriptives

Experience

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	35	2.63	1.239	.209	2.20	3.05	1	5
2	35	2.17	1.124	.190	1.79	2.56	1	5
3	35	2.40	1.241	.210	1.97	2.83	1	5
Total	105	2.40	1.206	.118	2.17	2.63	1	5

ANOVA

Experience

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.657	2	1.829	1.264	.287
Within Groups	147.543	102	1.446		
Total	151.200	104			

Descriptives

ExperienceBMC

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	35	2.23	1.114	.188	1.85	2.61	1	4
2	35	1.97	1.599	.270	1.42	2.52	1	6
3	35	1.94	1.259	.213	1.51	2.38	1	5
Total	105	2.05	1.333	.130	1.79	2.31	1	6

ANOVA

ExperienceBMC

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.733	2	.867	.483	.618
Within Groups	183.029	102	1.794		
Total	184.762	104			

Descriptives

ExperienceTenT

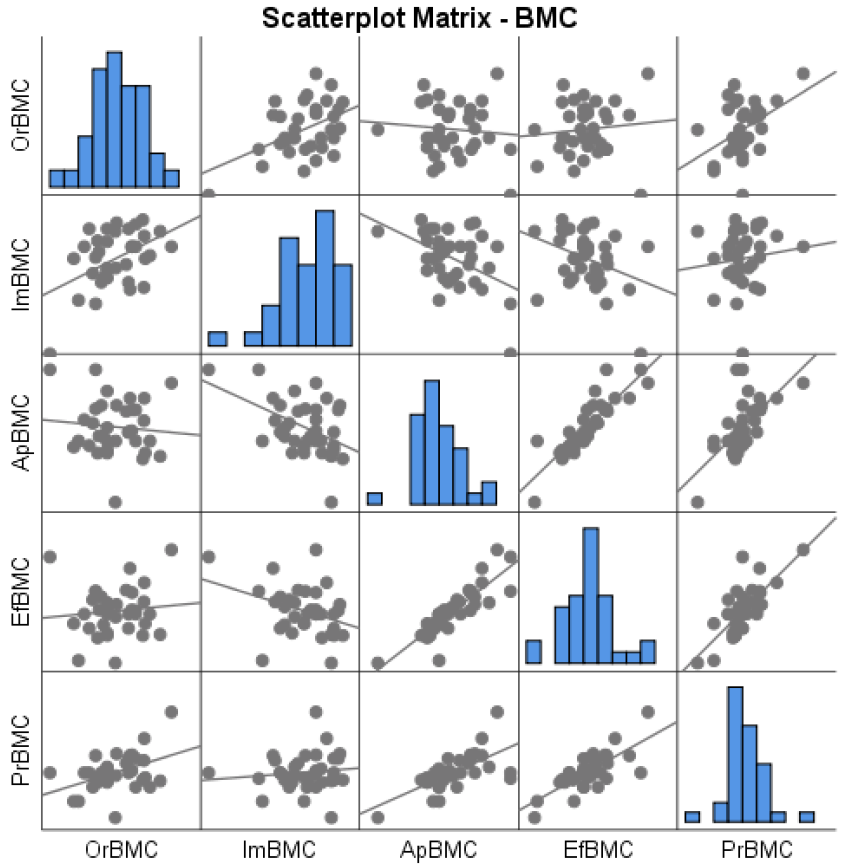
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	35	1.23	.598	.101	1.02	1.43	1	4
2	35	1.23	.808	.136	.95	1.51	1	5
3	35	1.20	.584	.099	1.00	1.40	1	4
Total	105	1.22	.665	.065	1.09	1.35	1	5

ANOVA

ExperienceTenT

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.019	2	.010	.021	.979
Within Groups	45.943	102	.450		
Total	45.962	104			

11.3.6 Linearity test of dependent variables with histograms and correlations

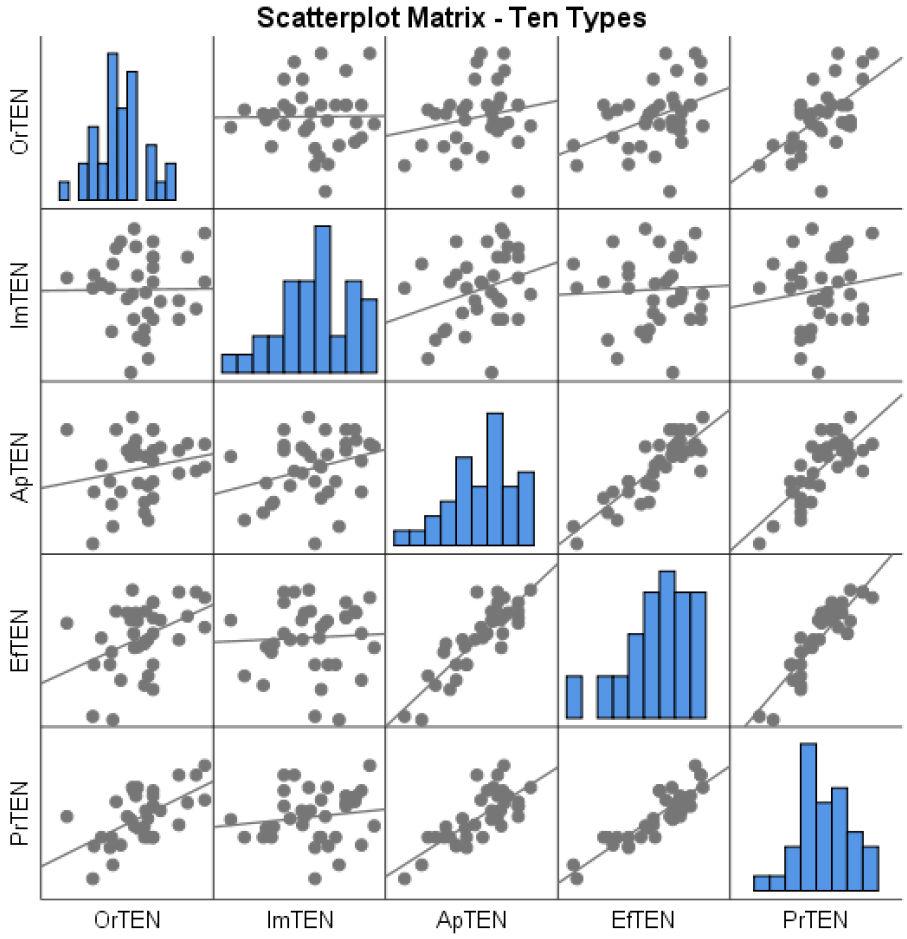


Correlations

		OrBMC	ImBMC	ApBMC	EfBMC	PrBMC
OrBMC	Pearson Correlation	1	.467**	-.093	.101	.438**
	Sig. (2-tailed)		.005	.595	.562	.009
	N	35	35	35	35	35
ImBMC	Pearson Correlation	.467**	1	-.471**	-.356*	.118
	Sig. (2-tailed)	.005		.004	.036	.500
	N	35	35	35	35	35
ApBMC	Pearson Correlation	-.093	-.471**	1	.869**	.665**
	Sig. (2-tailed)	.595	.004		.000	.000
	N	35	35	35	35	35
EfBMC	Pearson Correlation	.101	-.356*	.869**	1	.750**
	Sig. (2-tailed)	.562	.036	.000		.000
	N	35	35	35	35	35
PrBMC	Pearson Correlation	.438**	.118	.665**	.750**	1
	Sig. (2-tailed)	.009	.500	.000	.000	
	N	35	35	35	35	35

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

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

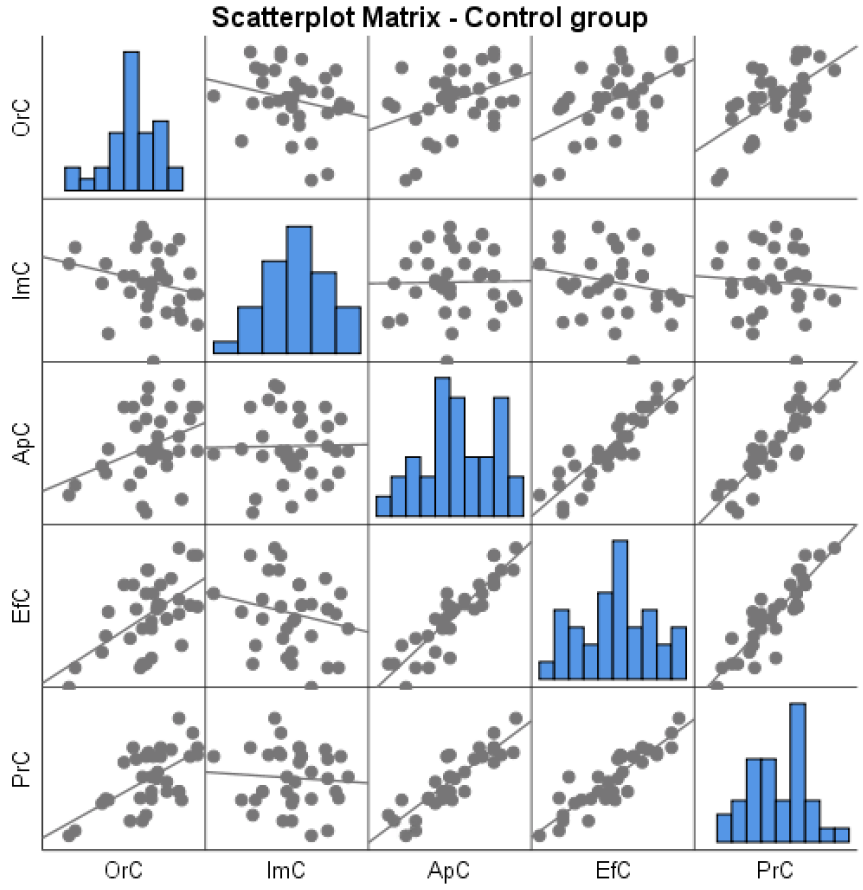


Correlations

		OrTEN	ImTEN	ApTEN	EfTEN	PrTEN
OrTEN	Pearson Correlation	1	.010	.201	.423*	.600**
	Sig. (2-tailed)		.953	.247	.011	.000
	N	35	35	35	35	35
ImTEN	Pearson Correlation	.010	1	.302	.051	.143
	Sig. (2-tailed)	.953		.078	.771	.413
	N	35	35	35	35	35
ApTEN	Pearson Correlation	.201	.302	1	.863**	.758**
	Sig. (2-tailed)	.247	.078		.000	.000
	N	35	35	35	35	35
EfTEN	Pearson Correlation	.423*	.051	.863**	1	.890**
	Sig. (2-tailed)	.011	.771	.000		.000
	N	35	35	35	35	35
PrTEN	Pearson Correlation	.600**	.143	.758**	.890**	1
	Sig. (2-tailed)	.000	.413	.000	.000	
	N	35	35	35	35	35

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

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



Correlations

		PrC	EfC	ApC	ImC	OrC
PrC	Pearson Correlation	1	.889**	.876**	-.072	.602**
	Sig. (2-tailed)		.000	.000	.682	.000
	N	35	35	35	35	35
EfC	Pearson Correlation	.889**	1	.901**	-.213	.568**
	Sig. (2-tailed)	.000		.000	.220	.000
	N	35	35	35	35	35
ApC	Pearson Correlation	.876**	.901**	1	.018	.387*
	Sig. (2-tailed)	.000	.000		.920	.022
	N	35	35	35	35	35
ImC	Pearson Correlation	-.072	-.213	.018	1	-.236
	Sig. (2-tailed)	.682	.220	.920		.171
	N	35	35	35	35	35
OrC	Pearson Correlation	.602**	.568**	.387*	-.236	1
	Sig. (2-tailed)	.000	.000	.022	.171	
	N	35	35	35	35	35

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

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

11.3.7 Tests for homogeneity of variance

Levene's Test of Equality of Error Variances[a]

		Levene Statistic	df1	df2	Sig.
Originality	Based on Mean	2.945	2	102	.057
	Based on Median	2.906	2	102	.059
	Based on Median and with adjusted df	2.906	2	94.798	.060
	Based on trimmed mean	2.928	2	102	.058
Implementability	Based on Mean	1.221	2	102	.299
	Based on Median	1.134	2	102	.326
	Based on Median and with adjusted df	1.134	2	91.118	.326
	Based on trimmed mean	1.151	2	102	.320
Applicability	Based on Mean	2.793	2	102	.066
	Based on Median	2.264	2	102	.109
	Based on Median and with adjusted df	2.264	2	86.586	.110
	Based on trimmed mean	2.829	2	102	.064
Effectiveness	Based on Mean	2.200	2	102	.116
	Based on Median	2.106	2	102	.127
	Based on Median and with adjusted df	2.106	2	80.139	.128
	Based on trimmed mean	2.218	2	102	.114
Priority	Based on Mean	1.001	2	102	.371
	Based on Median	.936	2	102	.396
	Based on Median and with adjusted df	.936	2	71.952	.397
	Based on trimmed mean	.934	2	102	.396

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Group

Box's Test of Equality of Covariance Matrices[a]

Box's M	98.630
F	3.055
df1	30
df2	32967.198
Sig.	.000

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + Group

11.3.8 Normality tests for dependent variables

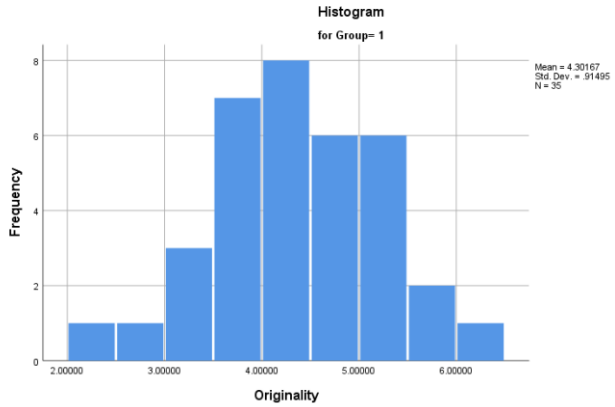
Tests of Normality

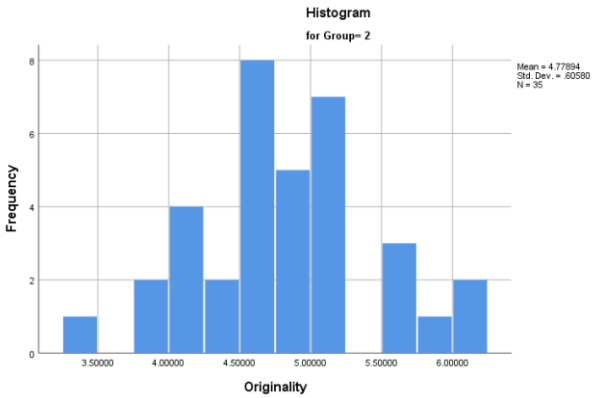
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Group	Statistic	df	Sig.	Statistic	df	Sig.
Originality	1	.115	35	.200*	.987	35	.945
	2	.158	35	.028	.972	35	.502
	3	.124	35	.195	.945	35	.078
Implementability	1	.121	35	.200*	.921	35	.016
	2	.074	35	.200*	.980	35	.748
	3	.081	35	.200*	.980	35	.755
Applicability	1	.099	35	.200*	.962	35	.270
	2	.133	35	.120	.958	35	.206
	3	.107	35	.200*	.968	35	.402
Effectiveness	1	.087	35	.200*	.970	35	.430
	2	.119	35	.200*	.939	35	.054
	3	.072	35	.200*	.978	35	.691
Priority	1	.137	35	.094	.932	35	.032
	2	.101	35	.200*	.984	35	.883
	3	.145	35	.062	.964	35	.291

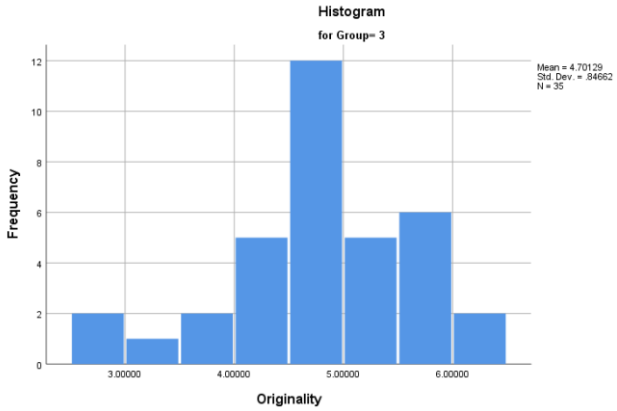
*. This is a lower bound of the true significance.

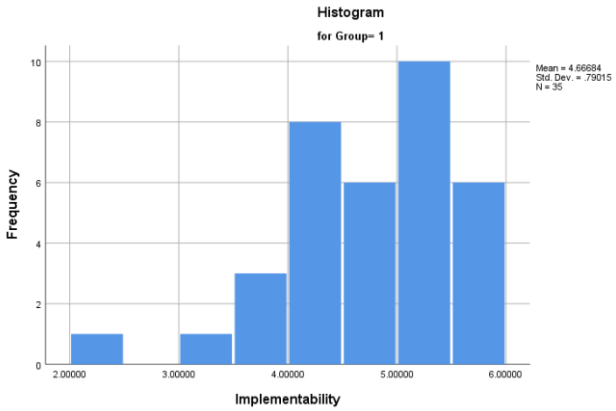
a. Lilliefors Significance Correction

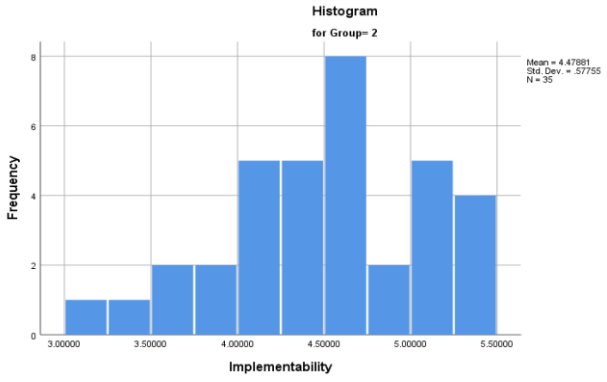
11.3.9 Histograms of dependent variable distributions

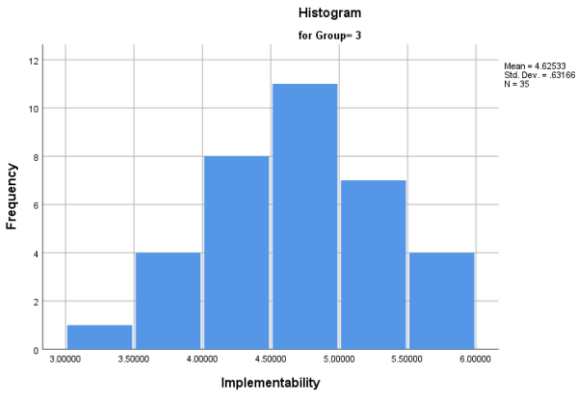


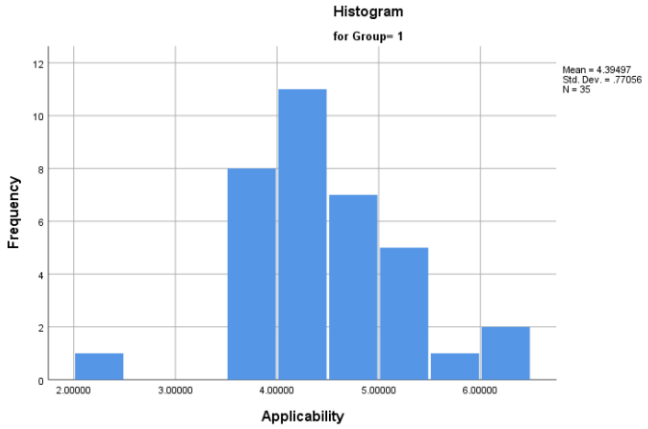


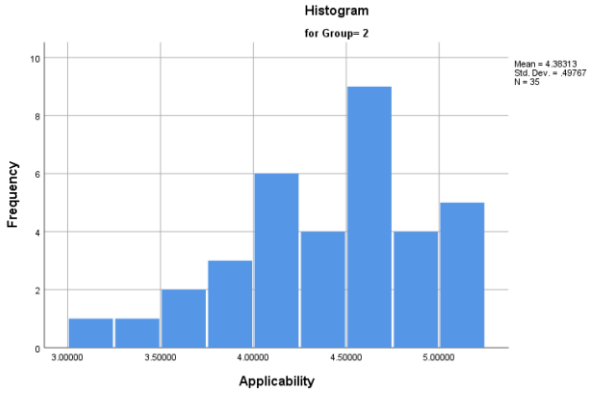


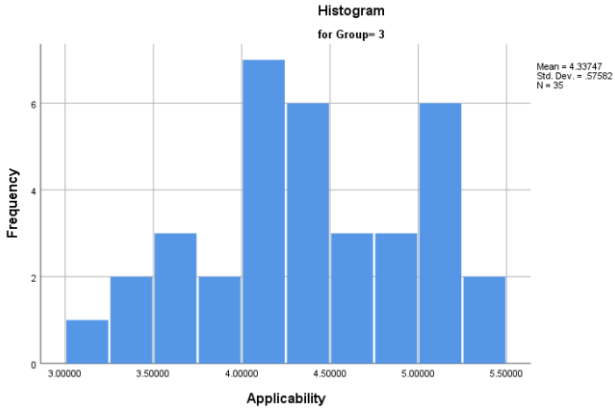


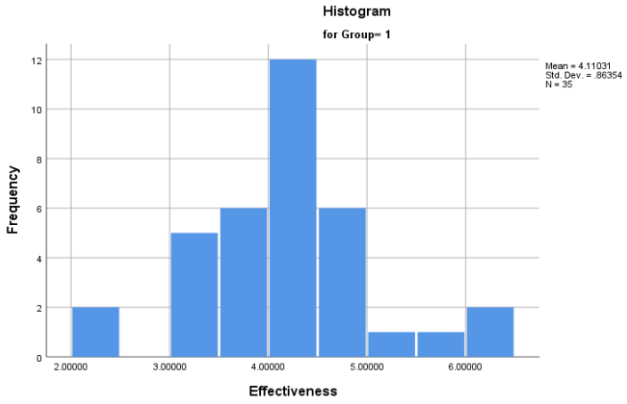


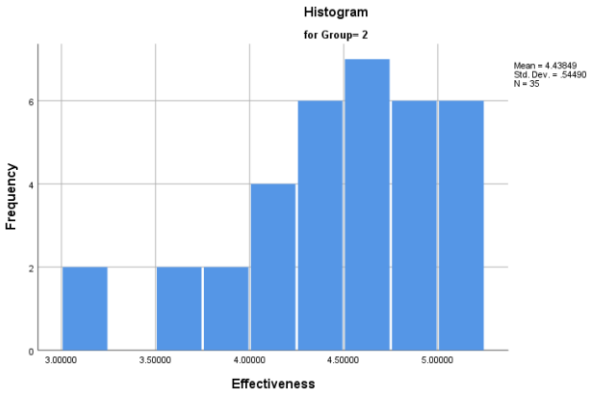


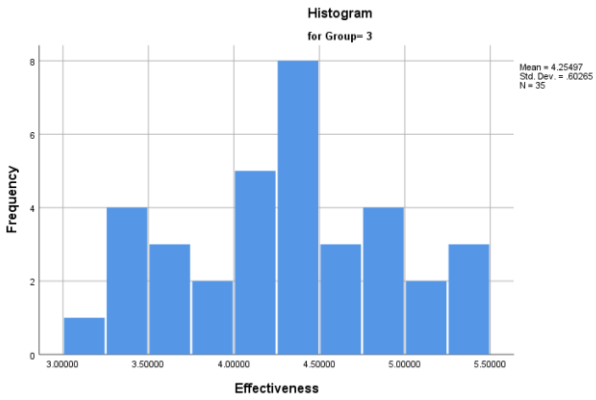

Histogram
for Group= 1
Mean = 4.39497
Std. Dev. = .77056
N = 35
Frequency
Applicability

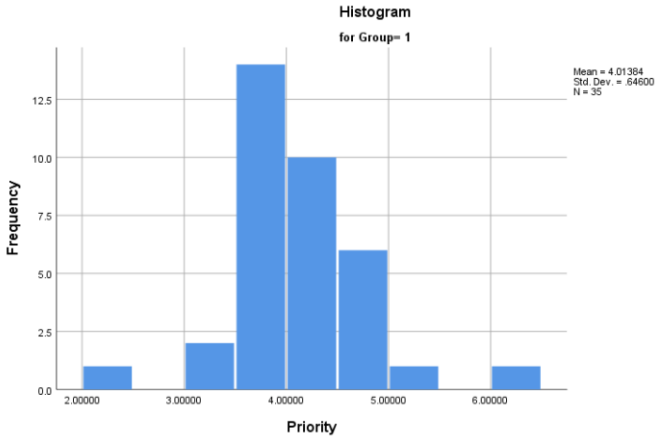

Histogram
for Group= 2
Mean = 4.38313
Std. Dev. = .49767
N = 35
Frequency
Applicability

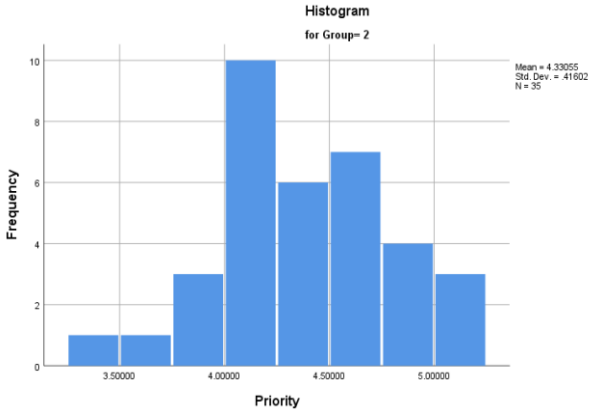

Histogram
for Group= 3
Mean = 4.33747
Std. Dev. = .57582
N = 35
Frequency
Applicability

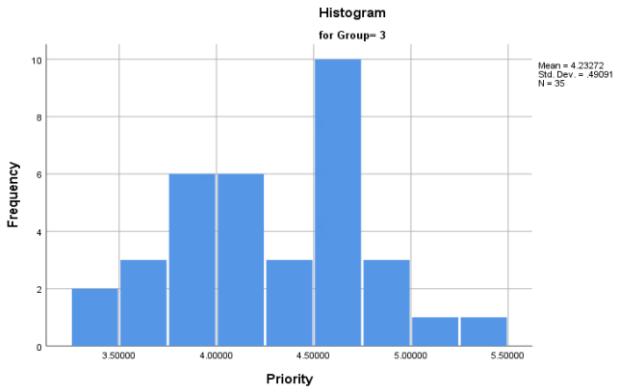

Histogram
for Group= 1
Mean = 4.11031
Std. Dev. = .86354
N = 35
Frequency
Effectiveness


Histogram
for Group= 2
Mean = 4.43849
Std. Dev. = .54490
N = 35
Frequency
Effectiveness


Histogram
for Group= 3
Mean = 4.25497
Std. Dev. = .60265
N = 35
Frequency
Effectiveness


Histogram
for Group= 1
Mean = 4.01384
Std. Dev. = .64600
N = 35
Frequency
Priority
2.00000
3.00000
4.00000
5.00000
6.00000


Histogram
for Group= 2
Mean = 4.33055
Std. Dev. = .41602
N = 35
Frequency
Priority
3.50000
4.00000
4.50000
5.00000


Histogram
for Group= 3
Mean = 4.23272
Std. Dev. = .49091
N = 35
Frequency
Priority
3.50000
4.00000
4.50000
5.00000
5.50000

11.3.10 Correlation test for multicollinearity

Dependent Variables - Correlation Matrix (N=105)

	Originiality	Implementability	Applicability	Effectivness	Priority
Originality	1	.104	.113	.339**	.552**
Implementability	.104	1	-.153	-.240*	.040
Applicability	.113	-.153	1	.857**	.717**
Effectivness	.339**	-.240*	.857**	1	.822**
Priority	.552**	.040	.717**	.822**	1

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

11.3.11 Dependent Variables MANOVA

General Linear Model

Between-Subjects Factors

		N
Group	1	35
	2	35
	3	35

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.992	2562.140[b]	5.000	98.000	.000	.992
	Wilks' Lambda	.008	2562.140[b]	5.000	98.000	.000	.992
	Hotelling's Trace	130.721	2562.140[b]	5.000	98.000	.000	.992
	Roy's Largest Root	130.721	2562.140[b]	5.000	98.000	.000	.992
Group	Pillai's Trace	.209	2.309	10.000	198.000	.014	.104
	Wilks' Lambda	.793	2.406[b]	10.000	196.000	.010	.109
	Hotelling's Trace	.258	2.501	10.000	194.000	.008	.114
	Roy's Largest Root	.247	4.886[c]	5.000	99.000	.000	.198

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Originality	4.591[a]	2	2.296	3.585	.031	.066
	Implementability	.683[b]	2	.342	.755	.473	.015
	Applicability	.065[c]	2	.032	.083	.921	.002
	Effectiveness	1.894[d]	2	.947	2.021	.138	.038
	Priority	1.841[e]	2	.920	3.321	.040	.061
Intercept	Originality	2215.975	1	2215.975	3460.858	.000	.971
	Implementability	2212.464	1	2212.464	4891.606	.000	.980
	Applicability	2006.877	1	2006.877	5132.643	.000	.981
	Effectiveness	1912.591	1	1912.591	4081.528	.000	.976
	Priority	1845.479	1	1845.479	6659.367	.000	.985
Group	Originality	4.591	2	2.296	3.585	.031	.066
	Implementability	.683	2	.342	.755	.473	.015
	Applicability	.065	2	.032	.083	.921	.002
	Effectiveness	1.894	2	.947	2.021	.138	.038
	Priority	1.841	2	.920	3.321	.040	.061
Error	Originality	65.310	102	.640			
	Implementability	46.134	102	.452			
	Applicability	39.882	102	.391			
	Effectiveness	47.797	102	.469			
	Priority	28.267	102	.277			
Total	Originality	2285.877	105				
	Implementability	2259.281	105				
	Applicability	2046.824	105				
	Effectiveness	1962.281	105				
	Priority	1875.587	105				
Corrected Total	Originality	69.901	104				
	Implementability	46.817	104				
	Applicability	39.947	104				
	Effectiveness	49.691	104				
	Priority	30.108	104				

a. R Squared = .066 (Adjusted R Squared = .047)

b. R Squared = .015 (Adjusted R Squared = -.005)

c. R Squared = .002 (Adjusted R Squared = -.018)

d. R Squared = .038 (Adjusted R Squared = .019)

e. R Squared = .061 (Adjusted R Squared = .043)

11.3.12 Bonferroni post hoc test

Post Hoc Tests

Group

Multiple Comparisons

Bonferroni

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Originality	1	2	-.4772738*	.19128087	.043	-.9428712	-.0116763
		3	-.3996259	.19128087	.118	-.8652233	.0659716
	2	1	.4772738*	.19128087	.043	.0116763	.9428712
		3	.0776479	.19128087	1.000	-.3879495	.5432454
	3	1	.3996259	.19128087	.118	-.0659716	.8652233
		2	-.0776479	.19128087	1.000	-.5432454	.3879495
Implementability	1	2	.1880267	.16076568	.735	-.2032937	.5793470
		3	.0415079	.16076568	1.000	-.3498124	.4328283
	2	1	-.1880267	.16076568	.735	-.5793470	.2032937
		3	-.1465187	.16076568	1.000	-.5378390	.2448016
	3	1	-.0415079	.16076568	1.000	-.4328283	.3498124
		2	.1465187	.16076568	1.000	-.2448016	.5378390
Applicability	1	2	.0118397	.14947577	1.000	-.3519998	.3756793
		3	.0574943	.14947577	1.000	-.3063452	.4213338
	2	1	-.0118397	.14947577	1.000	-.3756793	.3519998
		3	.0456546	.14947577	1.000	-.3181849	.4094941
	3	1	-.0574943	.14947577	1.000	-.4213338	.3063452
		2	-.0456546	.14947577	1.000	-.4094941	.3181849
Effectiveness	1	2	-.3281852	.16363667	.143	-.7264938	.0701234
		3	-.1446599	.16363667	1.000	-.5429685	.2536487
	2	1	.3281852	.16363667	.143	-.0701234	.7264938
		3	.1835254	.16363667	.794	-.2147832	.5818340
	3	1	.1446599	.16363667	1.000	-.2536487	.5429685
		2	-.1835254	.16363667	.794	-.5818340	.2147832
Priority	1	2	-.3167106*	.12584010	.040	-.6230184	-.0104028
		3	-.2188776	.12584010	.255	-.5251854	.0874303
	2	1	.3167106*	.12584010	.040	.0104028	.6230184
		3	.0978330	.12584010	1.000	-.2084748	.4041409
	3	1	.2188776	.12584010	.255	-.0874303	.5251854
		2	-.0978330	.12584010	1.000	-.4041409	.2084748

Based on observed means.
The error term is Mean Square(Error) = .277.

*. The mean difference is significant at the ,05 level.

11.3.13 T-test testing for significant dependent variables

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	OrBMC & OrTEN	35	-.037	.831
Pair 2	PrBMC & PrTEN	35	-.256	.137

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	OrBMC - OrTEN	-.47727376	1.11605259	.18864732	-.86065124	-.09389628	-2.530	34	.016
Pair 2	PrBMC - PrTEN	-.31671059	.85327601	.14422997	-.60982116	-.02360002	-2.196	34	.035

11.3.14 MANOVA controlling for moderating effects from experience variables

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Originality	7.763[a]	5	1.553	2.474	.037	.111
	Implementability	1.314[b]	5	.263	.572	.721	.028
	Applicability	1.352[c]	5	.270	.694	.629	.034
	Effectiveness	4.286[d]	5	.857	1.869	.107	.086
	Priority	3.371[e]	5	.674	2.496	.036	.112
Intercept	Originality	296.292	1	296.292	472.058	.000	.827
	Implementability	353.461	1	353.461	769.013	.000	.886
	Applicability	296.801	1	296.801	761.338	.000	.885
	Effectiveness	278.605	1	278.605	607.474	.000	.860
	Priority	264.780	1	264.780	980.424	.000	.908
Experience	Originality	.047	1	.047	.075	.784	.001
	Implementability	.274	1	.274	.596	.442	.006
	Applicability	.395	1	.395	1.013	.317	.010
	Effectiveness	.460	1	.460	1.004	.319	.010
	Priority	.272	1	.272	1.006	.318	.010
ExperienceBMC	Originality	.801	1	.801	1.276	.261	.013
	Implementability	.017	1	.017	.038	.846	.000
	Applicability	.170	1	.170	.437	.510	.004
	Effectiveness	.013	1	.013	.029	.864	.000
	Priority	.264	1	.264	.979	.325	.010
ExperienceTenT	Originality	1.228	1	1.228	1.956	.165	.019
	Implementability	.295	1	.295	.641	.425	.006
	Applicability	1.001	1	1.001	2.568	.112	.025
	Effectiveness	2.283	1	2.283	4.979	.028	.048
	Priority	1.088	1	1.088	4.028	.047	.039
Group	Originality	4.815	2	2.408	3.836	.025	.072
	Implementability	.870	2	.435	.946	.392	.019
	Applicability	.057	2	.029	.074	.929	.001
	Effectiveness	1.499	2	.749	1.634	.200	.032
	Priority	1.688	2	.844	3.126	.048	.059
Error	Originality	62.138	99	.628			
	Implementability	45.503	99	.460			
	Applicability	38.594	99	.390			
	Effectiveness	45.404	99	.459			
	Priority	26.737	99	.270			
Total	Originality	2285.877	105				
	Implementability	2259.281	105				
	Applicability	2046.824	105				
	Effectiveness	1962.281	105				
	Priority	1875.587	105				
Corrected Total	Originality	69.901	104				
	Implementability	46.817	104				
	Applicability	39.947	104				
	Effectiveness	49.691	104				
	Priority	30.108	104				

a. R Squared = .111 (Adjusted R Squared = .066)

b. R Squared = .028 (Adjusted R Squared = -.021)

c. R Squared = .034 (Adjusted R Squared = -.015)

d. R Squared = .086 (Adjusted R Squared = .040)

e. R Squared = .112 (Adjusted R Squared = .067)

11.3.15 Controlling for moderating effects from gender and year of study

General Linear Model

Between-Subjects Factors

		N
Group	1	35
	2	35
	3	35

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.878	137.905[b]	5.000	96.000	.000
	Wilks' Lambda	.122	137.905[b]	5.000	96.000	.000
	Hotelling's Trace	7.183	137.905[b]	5.000	96.000	.000
	Roy's Largest Root	7.183	137.905[b]	5.000	96.000	.000
Gender	Pillai's Trace	.049	.991[b]	5.000	96.000	.427
	Wilks' Lambda	.951	.991[b]	5.000	96.000	.427
	Hotelling's Trace	.052	.991[b]	5.000	96.000	.427
	Roy's Largest Root	.052	.991[b]	5.000	96.000	.427
Year	Pillai's Trace	.056	1.149[b]	5.000	96.000	.340
	Wilks' Lambda	.944	1.149[b]	5.000	96.000	.340
	Hotelling's Trace	.060	1.149[b]	5.000	96.000	.340
	Roy's Largest Root	.060	1.149[b]	5.000	96.000	.340
Group	Pillai's Trace	.220	2.394	10.000	194.000	.011
	Wilks' Lambda	.783	2.499[b]	10.000	192.000	.008
	Hotelling's Trace	.274	2.602	10.000	190.000	.006
	Roy's Largest Root	.261	5.064[c]	5.000	97.000	.000

a. Design: Intercept + Gender + Year + Group

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Originality	4.713[a]	4	1.178	1.807	.133
	Implementability	.692[b]	4	.173	.375	.826
	Applicability	.353[c]	4	.088	.223	.925
	Effectiveness	3.496[d]	4	.874	1.892	.118
	Priority	2.210[e]	4	.553	1.980	.103
Intercept	Originality	124.730	1	124.730	191.337	.000
	Implementability	125.876	1	125.876	272.899	.000
	Applicability	103.342	1	103.342	261.006	.000
	Effectiveness	84.856	1	84.856	183.692	.000
	Priority	96.657	1	96.657	346.473	.000
Gender	Originality	.087	1	.087	.134	.715
	Implementability	.005	1	.005	.011	.918
	Applicability	.108	1	.108	.273	.602
	Effectiveness	.928	1	.928	2.008	.160
	Priority	.369	1	.369	1.321	.253
Year	Originality	.041	1	.041	.062	.804
	Implementability	.005	1	.005	.010	.921
	Applicability	.165	1	.165	.417	.520
	Effectiveness	.591	1	.591	1.279	.261
	Priority	6.088E-5	1	6.088E-5	.000	.988
Group	Originality	4.585	2	2.293	3.517	.033
	Implementability	.681	2	.340	.738	.481
	Applicability	.068	2	.034	.086	.918
	Effectiveness	2.122	2	1.061	2.297	.106
	Priority	1.900	2	.950	3.406	.037
Error	Originality	65.189	100	.652		
	Implementability	46.125	100	.461		
	Applicability	39.594	100	.396		
	Effectiveness	46.195	100	.462		
	Priority	27.898	100	.279		
Total	Originality	2285.877	105			
	Implementability	2259.281	105			
	Applicability	2046.824	105			
	Effectiveness	1962.281	105			
	Priority	1875.587	105			
Corrected Total	Originality	69.901	104			
	Implementability	46.817	104			
	Applicability	39.947	104			
	Effectiveness	49.691	104			
	Priority	30.108	104			

a. R Squared = .067 (Adjusted R Squared = .030)

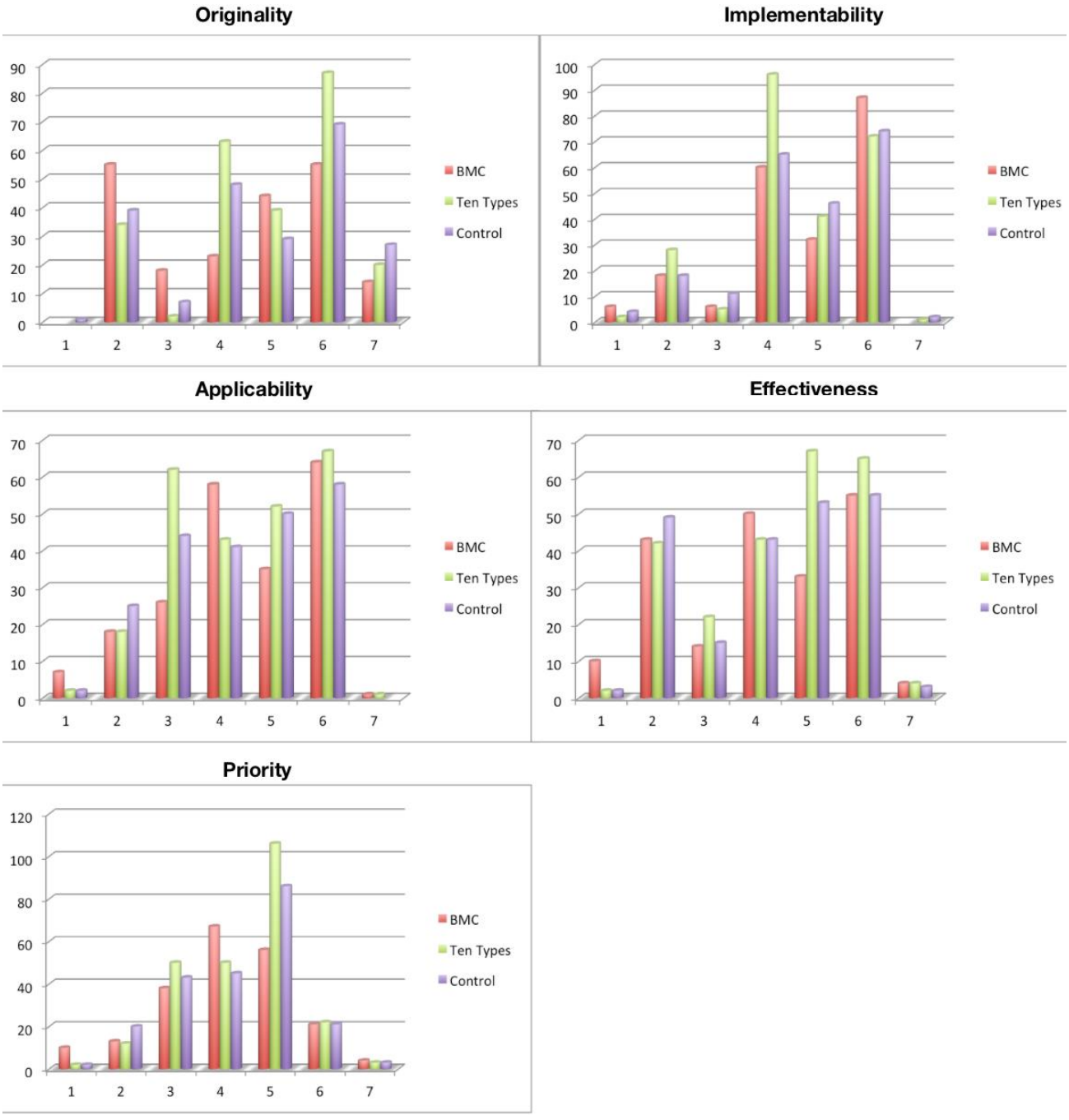
b. R Squared = .015 (Adjusted R Squared = -.025)

c. R Squared = .009 (Adjusted R Squared = -.031)

d. R Squared = .070 (Adjusted R Squared = .033)

e. R Squared = .073 (Adjusted R Squared = .036)

11.3.16 Differences on the idea level



11.3.17 ANOVA testing for quantity of ideas

Descriptives

Numberideas

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	35	6.03	2.256	.381	5.25	6.80	2	11
2	35	6.91	2.381	.402	6.10	7.73	3	13
3	35	6.31	2.471	.418	5.47	7.16	2	12
Total	105	6.42	2.377	.232	5.96	6.88	2	13

ANOVA

Numberideas

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.305	2	7.152	1.273	.285
Within Groups	573.257	102	5.620		
Total	587.562	104			

11.3.18 ANOVA testing perceived creativity

ANOVA

PercivedCre

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.229	2	.114	.082	.921
Within Groups	141.829	102	1.390		
Total	142.057	104			

11.3.19 Testing extreme values for dependent variables

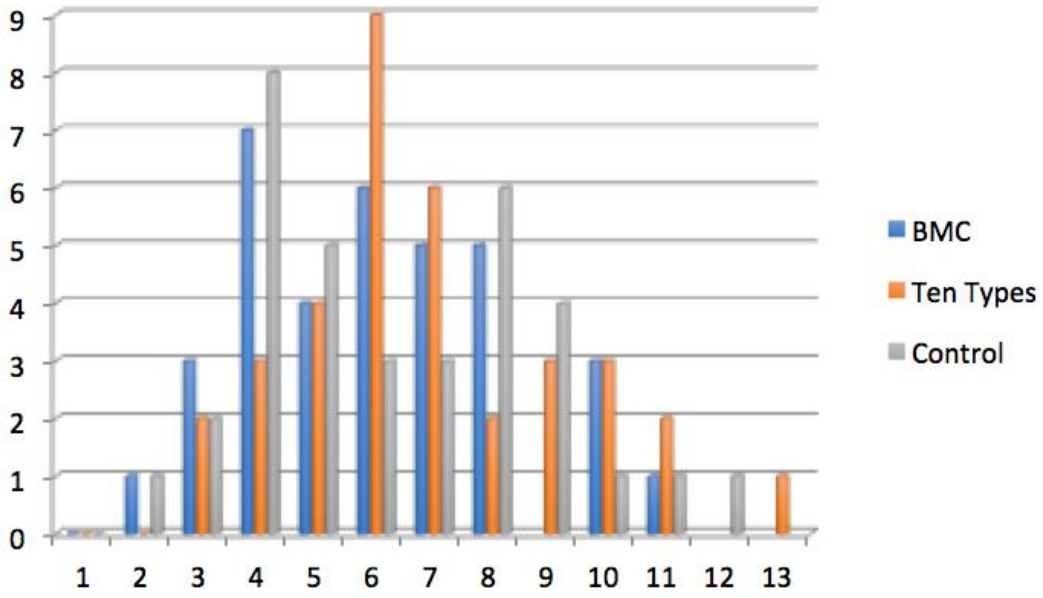
Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Originality >=6	1	69	6.2029	.40510	.04877	6.1056	6.3002	6.00	7.00
	2	107	6.1869	.39168	.03786	6.1118	6.2620	6.00	7.00
	3	96	6.2813	.45197	.04613	6.1897	6.3728	6.00	7.00
	Total	272	6.2243	.41787	.02534	6.1744	6.2741	6.00	7.00
Implementability >=6	1	87	6.0000	.00000	.00000	6.0000	6.0000	6.00	6.00
	2	73	6.0137	.11704	.01370	5.9864	6.0410	6.00	7.00
	3	76	6.0263	.16114	.01848	5.9895	6.0631	6.00	7.00
	Total	236	6.0127	.11227	.00731	5.9983	6.0271	6.00	7.00
Applicability >=6	1	65	6.0154	.12403	.01538	5.9847	6.0461	6.00	7.00
	2	68	6.0147	.12127	.01471	5.9854	6.0441	6.00	7.00
	3	58	6.0000	.00000	.00000	6.0000	6.0000	6.00	6.00
	Total	191	6.0105	.10206	.00738	5.9959	6.0250	6.00	7.00
Effectivness >=6	1	59	6.0678	.25355	.03301	6.0017	6.1339	6.00	7.00
	2	69	6.0580	.23540	.02834	6.0014	6.1145	6.00	7.00
	3	58	6.0517	.22340	.02933	5.9930	6.1105	6.00	7.00
	Total	186	6.0591	.23652	.01734	6.0249	6.0934	6.00	7.00
Priority >=6	1	25	6.1600	.37417	.07483	6.0056	6.3144	6.00	7.00
	2	25	6.1200	.33166	.06633	5.9831	6.2569	6.00	7.00
	3	24	6.1250	.33783	.06896	5.9823	6.2677	6.00	7.00
	Total	74	6.1351	.34420	.04001	6.0554	6.2149	6.00	7.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Originality >=6	Between Groups	.493	2	.246	1.415	.245
	Within Groups	46.827	269	.174		
	Total	47.320	271			
Implementability >=6	Between Groups	.028	2	.014	1.120	.328
	Within Groups	2.934	233	.013		
	Total	2.962	235			
Applicability >=6	Between Groups	.009	2	.005	.437	.647
	Within Groups	1.970	188	.010		
	Total	1.979	190			
Effectivness >=6	Between Groups	.008	2	.004	.068	.934
	Within Groups	10.342	183	.057		
	Total	10.349	185			
Priority >=6	Between Groups	.024	2	.012	.097	.907
	Within Groups	8.625	71	.121		
	Total	8.649	73			

11.3.20 Count of participants and number of ideas per participant



11.3.21 Testing number of ideas without low values

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Ideas >=5	1	24	7.1667	1.73623	.35441	6.4335	7.8998	5.00	11.00
	2	30	7.4667	2.09652	.38277	6.6838	8.2495	5.00	13.00
	3	24	7.5417	1.95558	.39918	6.7159	8.3674	5.00	12.00
	Total	78	7.3974	1.92954	.21848	6.9624	7.8325	5.00	13.00
Ideas >=6	1	20	7.6000	1.56945	.35094	6.8655	8.3345	6.00	11.00
	2	26	7.8462	1.99384	.39102	7.0408	8.6515	6.00	13.00
	3	19	8.2105	1.61861	.37133	7.4304	8.9907	6.00	12.00
	Total	65	7.8769	1.75453	.21762	7.4422	8.3117	6.00	13.00
Ideas >=7	1	14	8.2857	1.38278	.36956	7.4873	9.0841	7.00	11.00
	2	17	8.8235	1.81091	.43921	7.8924	9.7546	7.00	13.00
	3	16	8.6250	1.40831	.35208	7.8746	9.3754	7.00	12.00
	Total	47	8.5957	1.54159	.22486	8.1431	9.0484	7.00	13.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Ideas >=5	Between Groups	1.921	2	.961	.253	.777
	Within Groups	284.758	75	3.797		
	Total	286.679	77			
Ideas >=6	Between Groups	3.673	2	1.836	.589	.558
	Within Groups	193.343	62	3.118		
	Total	197.015	64			
Ideas >=7	Between Groups	2.241	2	1.121	.461	.634
	Within Groups	107.078	44	2.434		
	Total	109.319	46			

11.4 Complete list with experiment ideas and ratings at the participant level

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Group	Or	Im	Ap	Ef	Pr	Ag	Gen	Year	N.I	Egen	Ebmc	E10T	PD	PC	PV
2	1	3,0	3,5	4,0	2,4	3,0	30	1	2	8	4	4	1	2	4	4
3	1	3,7	5,2	3,7	3,2	3,7	19	1	1	6	3	2	1	5	3	4
4	1	3,9	4,1	4,1	3,6	3,8	25	1	5	8	5	3	1	2	3	2
5	1	3,6	3,4	6,0	4,8	3,8	23	1	4	5	4	4	1	1	4	2
6	1	5,3	5,3	5,2	5,1	5,2	22	1	4	10	4	3	1	4	3	4
7	1	4,0	5,5	3,8	3,3	3,8	22	1	4	4	2	1	1	2	3	4
8	1	5,3	4,7	3,7	3,7	3,8	24	1	4	6	1	4	1	5	2	2
9	1	2,0	2,0	6,0	6,0	4,0	21	2	3	3	2	1	2	3	2	1
10	1	5,0	5,6	4,9	4,1	4,5	24	2	5	8	2	2	1	4	3	2
11	1	3,2	5,0	4,6	4,0	4,0	24	1	4	5	2	1	1	5	1	3
12	1	5,9	5,4	3,6	3,3	3,7	22	2	3	7	2	1	1	6	1	1
13	1	4,3	5,4	2,3	2,3	2,4	23	1	4	7	3	2	2	5	2	2
14	1	3,7	4,9	4,1	4,1	3,9	23	1	5	7	3	2	1	2	3	3
15	1	3,8	4,0	5,0	4,6	4,0	25	1	5	6	3	3	1	2	1	1
16	1	3,4	5,5	3,9	3,5	4,0	23	2	3	11	2	1	1	2	4	4
17	1	3,6	4,7	4,9	4,8	4,6	23	2	4	10	2	1	1	3	2	1
18	1	4,8	5,5	4,3	4,0	4,5	24	1	3	4	2	1	1	5	2	2
19	1	4,8	4,0	4,3	3,5	4,0	25	2	5	4	5	4	1	4	2	2
20	1	4,7	4,5	4,8	4,8	4,3	23	2	5	6	1	2	1	5	1	1
21	1	5,5	4,8	4,0	4,0	3,5	23	1	4	4	5	2	1	3	4	4
22	1	4,3	5,7	5,0	4,3	4,7	23	2	5	3	1	2	2	6	1	2
23	1	4,0	5,1	4,0	4,0	4,1	24	2	4	7	4	3	1	5	2	2
24	1	3,5	4,3	4,5	4,5	3,5	24	2	5	4	1	1	1	2	1	1
25	1	5,3	5,8	3,5	3,3	3,8	20	2	1	4	3	4	1	5	3	3
26	1	4,9	5,0	4,9	4,8	4,6	22	1	4	8	3	3	2	2	2	6
27	1	4,8	3,8	5,2	5,6	4,6	24	2	5	5	3	1	1	3	3	2
28	1	5,0	5,0	4,0	4,0	3,5	23	2	3	2	1	1	1	6	1	1
29	1	4,9	5,0	4,3	4,1	4,1	24	2	4	4	5	4	4	6	3	2
30	1	4,0	4,3	3,7	3,3	3,7	23	1	5	3	2	2	1	5	2	3
31	1	2,8	4,7	3,8	3,7	3,0	25	2	5	6	2	3	1	3	2	3
32	1	4,0	4,1	4,4	4,3	3,9	25	1	4	6	2	1	1	3	3	3
33	1	4,3	4,4	4,0	3,9	3,9	26	2	4	10	2	3	1	2	4	4
34	1	5,3	3,9	4,6	4,4	4,4	22	1	4	7	3	3	1	3	3	2
35	1	6,3	5,0	5,6	6,3	6,1	25	1	1	8	1	1	1	4	1	1
36	1	4,0	4,4	5,4	4,4	4,2	19	1	1	5	2	2	2	3	3	2
37	2	6,0	5,4	4,8	5,1	5,2	29	1	5	13	4	5	3	2	3	4
38	2	4,7	4,7	4,6	4,7	4,8	21	1	3	10	4	6	1	4	2	3
39	2	4,6	3,1	4,6	4,7	4,3	31	1	5	5	3	2	1	3	3	2
40	2	4,2	3,8	3,8	4,2	4,0	23	1	3	5	3	1	1	5	2	2
40	2	4,2	3,8	3,8	4,2	4,0	23	1	3	5	3	1	1	5	2	2
41	2	4,0	4,6	4,4	4,4	4,0	24	1	3	7	1	1	1	3	1	2
42	2	4,8	3,8	3,8	4,3	4,2	24	2	5	6	2	1	1	4	2	4
43	2	5,5	4,0	4,7	5,2	5,0	25	2	1	6	3	1	1	3	3	3
44	2	5,0	5,0	4,7	5,0	4,7	24	1	4	3	2	1	1	3	2	2
45	2	5,5	4,3	4,3	4,4	4,2	25	1	4	9	2	1	1	3	3	4
46	2	4,5	4,3	4,7	4,8	4,3	22	2	3	6	1	1	1	4	3	3
47	2	4,9	3,4	3,5	3,8	4,0	23	1	4	11	2	4	1	5	5	5
48	2	6,0	4,6	4,4	4,6	4,6	23	2	3	5	1	1	1	3	3	3
49	2	4,7	3,7	4,1	4,3	4,1	26	2	4	7	2	2	1	5	4	5
50	2	5,8	4,2	4,3	5,2	5,0	23	2	4	6	4	4	5	3	4	3
51	2	3,8	4,5	3,2	3,2	3,3	22	2	2	6	2	1	1	4	1	2
52	2	5,0	4,8	4,2	4,0	4,0	24	1	4	6	4	6	1	3	2	6
53	2	4,8	3,7	3,7	3,7	4,0	25	1	4	6	1	1	1	6	2	1
54	2	3,3	4,7	5,0	4,7	4,3	24	2	4	3	1	1	1	6	1	3
55	2	4,4	5,3	4,0	3,8	3,9	24	2	4	8	2	1	1	5	2	4
56	2	5,0	4,6	3,9	3,6	4,0	20	1	1	10	2	1	1	4	4	4
57	2	4,2	4,5	4,2	4,0	3,8	20	1	1	6	2	1	1	3	2	3
58	2	4,2	4,9	3,4	3,1	3,6	28	1	5	9	1	2	1	3	1	1
59	2	4,9	4,1	4,1	4,4	4,3	23	1	4	10	5	6	1	1	5	4
60	2	5,0	5,3	4,5	4,5	4,8	24	2	5	4	1	1	1	6	1	3
61	2	4,7	5,2	4,8	4,8	4,7	36	1	5	6	3	2	3	4	4	4
62	2	4,3	5,1	5,0	4,9	4,6	23	1	5	7	3	3	1	3	2	5
63	2	5,7	5,0	4,8	4,8	4,6	21	2	1	9	1	2	1	1	2	2
64	2	4,6	4,4	5,2	5,2	4,8	23	1	3	5	1	1	1	3	3	2
65	2	4,6	5,5	4,7	4,3	4,2	25	2	3	11	1	1	1	4	4	3
66	2	4,9	4,4	4,6	4,9	4,4	27	2	5	7	1	1	1	5	1	2
67	2	5,0	4,0	5,0	5,0	4,5	24	1	4	4	3	2	1	3	1	1
68	2	5,0	5,0	5,0	4,8	4,5	24	1	4	4	2	1	1	3	5	4
69	2	3,9	4,7	4,0	4,0	3,9	23	1	5	7	2	1	1	5	2	2
70	2	5,1	4,3	4,7	4,7	4,4	23	1	3	7	1	1	1	5	1	1
71	2	4,6	4,0	4,8	4,5	4,8	29	2	4	8	3	2	1	5	2	4
72	3	5,5	5,5	4,3	4,3	4,0	23	2	3	4	1	1	1	6	1	1
73	3	4,0	4,8	5,0	4,8	4,5	24	2	5	4	4	4	2	3	3	3
74	3	4,5	5,8	4,3	4,0	4,3	21	2	3	4	2	4	1	5	2	2
75	3	4,8	4,5	4,3	3,5	4,3	20	1	1	4	2	3	1	3	1	2

75	3	4,8	4,5	4,3	3,5	4,3	20	1	1	4	2	3	1	3	1	2
76	3	5,0	4,8	4,8	4,8	4,8	24	1	4	4	1	1	1	3	6	5
77	3	3,6	3,6	4,3	4,3	3,9	23	2	4	7	1	3	1	5	1	2
78	3	3,4	4,6	4,0	3,6	3,8	27	1	4	5	3	2	1	5	2	2
79	3	5,3	5,3	5,0	4,9	4,7	24	1	5	7	4	4	1	3	3	3
80	3	5,5	4,3	5,4	5,4	5,3	26	2	5	8	1	2	1	2	2	2
81	3	6,0	3,8	5,0	5,3	4,8	24	2	5	4	4	5	2	5	4	3
82	3	4,9	5,3	4,3	4,3	4,2	24	1	5	9	3	1	1	2	5	6
83	3	4,8	4,5	4,1	4,0	4,0	23	1	4	8	2	3	1	2	1	1
84	3	5,2	4,7	4,0	4,2	4,2	25	1	4	6	4	3	1	3	2	2
85	3	5,5	4,0	4,5	4,5	4,0	28	1	4	2	2	1	1	4	5	4
86	3	4,9	5,0	4,5	4,4	4,3	24	2	5	12	5	2	2	2	4	4
87	3	4,3	5,3	4,7	4,3	4,6	25	2	3	9	2	1	1	4	2	2
88	3	6,0	4,4	4,3	4,4	4,6	26	2	3	8	2	1	1	6	1	3
89	3	4,2	4,4	3,7	3,8	3,5	26	1	5	11	1	1	1	4	2	3
90	3	4,6	5,6	4,8	4,6	4,6	25	1	5	6	2	1	1	5	3	3
91	3	5,2	4,0	4,2	4,2	4,0	21	1	3	6	3	1	1	3	3	2
92	3	4,8	3,0	4,2	4,6	4,6	19	2	1	5	2	2	1	5	2	3
93	3	4,8	4,6	4,1	4,1	3,9	24	1	5	8	1	1	1	5	3	2
94	3	4,7	4,3	5,3	5,0	4,7	22	1	2	3	1	1	1	6	1	1
95	3	4,5	4,6	3,3	3,4	3,5	23	2	4	10	2	1	1	5	1	1
96	3	4,3	4,8	5,0	4,8	4,8	23	2	3	4	1	1	1	5	3	2
97	3	5,8	4,8	4,8	4,4	4,6	23	1	5	5	5	4	4	4	4	5
98	3	4,6	4,1	5,1	5,0	4,6	24	2	5	8	4	3	2	3	2	2
99	3	2,5	5,0	3,5	3,0	3,3	23	1	2	4	3	1	1	4	3	3
100	3	4,6	3,8	3,2	3,4	3,6	25	1	3	5	2	1	1	1	1	1
101	3	5,0	4,8	4,2	4,4	4,6	25	2	5	5	4	4	1	5	2	3
102	3	2,7	5,3	3,7	3,3	3,3	22	1	3	3	1	1	1	5	2	2
103	3	5,9	4,4	5,0	5,3	5,0	23	1	1	8	1	1	1	4	2	3
104	3	5,6	3,9	3,4	3,7	3,9	25	2	4	7	3	1	1	5	2	2
105	3	3,5	5,0	3,9	3,9	3,9	23	2	4	9	3	1	1	5	2	2
106	3	4,4	5,6	3,9	3,3	3,9	22	1	3	9	2	1	1	3	3	2
107																