Applying social innovations in the manufacturing industry - How does it influence financial performance?

Author: Stan Claassen

Student number: s4793978

Supervisor: dr. Vaessen, Peter

Co-reader: Dentchev, Nikolay

Radboud University Nijmegen

14th of June 2021

Abstract

This thesis wants to research the influence of social innovations on the financial performance of Dutch firms in the manufacturing industry. The research question is stated as: '*What is the influence of social innovations on the financial performance of Dutch firms in the manufacturing industry?*'. Social innovations are part of Corporate Social Responsibility (CSR) innovations. Social innovations are focused on using knowledge, increasing innovation power, firm productivity and competitiveness while influencing the firm surroundings, sustainability and society. This thesis wants to find out how social innovations influence two indicators of financial performance, 'revenue growth' and 'production costs'. In the theoretical framework this came to two separate hypotheses. This thesis hypothesizes that social innovations have an increasing effect on the revenue growth of a firm. It is also hypothesized that social innovations decrease the production costs of a firm. Both quantitative and qualitative research has been conducted. The European Manufacturing Survey (EMS) is used and four interviews were held at manufacturing firms. In the results, no significant relationship has been found between social innovations and revenue growth. There was a significant negative relationship found between social innovations and production costs. Overall, this thesis concluded that social innovations do influence financial performance of a firm, primarily the production costs.

Keywords: Social innovations, Corporate Social Responsibility (CSR), technological innovations, manufacturing industry, financial performance, revenue growth, production costs

Preface

'Applying social innovations in the manufacturing industry - How does it influence financial performance?', a thesis written by Stan Claassen. To graduate from the master 'Strategic Management', this thesis was the final step. The last few months were an interesting process, with its ups and downs. Overall, writing this thesis has been a very informative and learning experience. To me, it was a nice opportunity to finish my time at the Radboud University in Nijmegen. Now, I feel very proud of the end product, my very own master thesis! I would like to thank my supervisor dr. P. Vaessen for the feedback provided and all the other help during the whole process. I would also like to thank dr. N. Dentchev for being the second supervisor, and Ian Cornielje and Henk Oosterdijk for being helpful and reflective during the thesis meetings. Hopefully, this thesis will be a fun and informative read.

Stan Claassen,
Nijmegen, 14th of June 2021

Table of contents

1.   Introduction

1.1   Research motive, relevance and scientific debate

Every firm intends to be successful, but there is not just one way to get there. Multiple firm structures and firm strategies could lead to becoming successful (Lawrence, 2016). Nowadays consumers look for or support firms with a responsible side, the 'original capitalist's view' of just maximizing profits receives ever more criticism (Freeman, Harrison, Wicks, Parmar & De Colle, 2010). A prime example is Shell, as a large firm in the oil industry they received a lot of criticism and they are pushed, even by their shareholders, to become more energy-efficient (NRC Handelsblad, 2021). Because their position on the market was hit, they are almost forced to react and innovate to become more socially responsible (NRC Handelsblad, 2021). This is just an example of a development that shows consumers and shareholders are looking beyond products or profits, as there is a growing tendency to buy from or invest in responsible firms. This relates with statements by Phillips (2003), who among other things mentions that in the 21st-century firms have a lot more moral and social issues to deal with. The basis of this thesis will therefore be Corporate Social Responsibility (CSR) innovations. CSR is described as the way a firm integrates social, environmental and economic aspects into their values, culture, decisions, strategy and business operations (The Institute of Internal Auditors, 2010). As shown by this description, CSR is a broad term that encompasses a lot of things. The amount of CSR studies is steadily growing as CSR is still a relatively new concept despite a growing number of firms adopting parts of this strategy (Jamali and Karam, 2018).

CSR is mostly seen as a new tool to become successful, but research did not reach any real consensus on the relationship between CSR and performance outputs (Cochran & Wood, 1984). Cochran and Wood (1984) did mention that CSR would be hard to measure objectively and that it should be measured in multiple perceptions. This statement remains relevant in the scientific debate, as later research showed multiple ways of measuring CSR and firm performance. Examples are: CSR-influence on financial performance (Lawrence, 2016), CSR-influence on firm reputation (Del Mar Miras-Rodríguez, Bravo-Urquiza and Escobar-Pérez, 2020) or CSR-influence on competitive abilities of firms (Juščius & Snieška, 2008). Because of these different measures, it is hard to compare results and come to an overarching answer. CSR has most of the time been equated with 'doing good' (Wood, 2010). There are, however, several conflicting perspectives and results as well, for example by Del Mar Miras-Rodríguez et al. (2020), who say CSR harms the reputation of a firm.

Within CSR, certain innovations can be executed, Alonso-Martínez, González-Álvarez and Nieto (2019) call these Social Innovations (SI). SI includes innovations introduced by firms who contribute in new ways to improve the quality of life for society and sustain economic benefits on the side (Alonso-Martínez et al., 2019). Mumford (2002) mentioned social innovations before and stated that

it involves the creation of new processes and procedures for structuring work, plus contributing to the development of new business practices. Tucker, Mulgan, Ali and Sanders (2007) added a distinction within CSR and mentioned that social innovations are a key part next to technological innovations. Although there is no shortage of technological innovation research, there is less known about social innovations in business and technology as well as a lack of practical attention towards it (Tucker et al., 2007). Van der Have and Rubalcaba (2016) acknowledged this and used 172 publications trying to build a conceptual bridge between social innovation and innovation studies. They concluded that a well-defined policy for social innovation could be useful for facilitating social innovations and therefore diffuse it to society, but a lot of times this is overlooked (Van der Have & Rubalcaba, 2016). Adding on, Gasparin, Green, Lilley, Quinn, Saren and Schinckus (2021) speak about a still existent need for a strategic framework for small and medium-sized businesses to create and capture value from social innovations. This shows that social innovations are not always present in firms, which Heerwagen (2010) describes as alarming and thus calls for it to become a common practice.

Volberda, Commandeur, Van den Bosch and Heij (2013) categorized social innovations to give a better overview. The underlying categories of social innovations given are; 'flexible organizing', 'dynamic management', 'working smarter' and 'co-creation' (Volberda et al., 2013, p. 6). Flexible organizing encompasses the use of innovative organizing forms, for example, a new divisional structure (Volberda et al., 2013). The category of dynamic management consists of the development of new management skills and passing these skills on (Volberda et al., 2013). The third category about working smarter wants to realize high-quality work relations in a firm, for example, less bureaucracy to improve efficiency (Volberda et al., 2013). The last category by Volberda et al. (2013) is about co-creation, which consists of working together in a firm to implement and gain results with social innovations. As the first step in this thesis, it will be indicated what kind of social innovations are present in a firm, filtered into the categories mentioned by Volberda et al. (2013). Further elaboration about the categorizing of social innovations will be given in the theoretical framework section.

With the elaboration on the relevance and the categories of social innovation the starting point of this thesis is given. If a firm wants to implement social innovations, it seems fair that they want to know what results it will bring them. Alonso-Martínez et al. (2019) linked social innovation and financial performance and concluded that it should be seen as a circular process, it affects each other positively. Bacinello, Tontini and Alberton (2019) mentioned social innovations as part of CSR and linked them to business performance. Business performance was divided into value creation, generating a competitive advantage and promoting superior performance and they were all positively affected by social innovations (Bacinello et al., 2019). Volberda et al. (2013) showed that social innovations can influence financial performance in a lot of ways. Social innovations can for example lead to improved productivity with lower costs because of smarter working. If knowledge is passed on better in a firm,

social innovations can lead to revenue growth because of improved productivity and fewer costs (Volberda et al., 2013). Another example is the social innovation 'working from home', which can lead to improved efficiency, which in the long run can lead to more sales and eventually a bigger market share (Volberda et al., 2013). In this way, social innovations influence the financial performance of a firm. Lawrence (2016) mentions that firms who innovate socially are more likely to reach better financial performance in the long run. Despite most of these examples showing a positive relationship, research by Su, Liu and Teng (2020) showed negative effects of CSR-dimensions on financial performance. Overall, 132 top-tier papers were reviewed by Alshehhi, Nobanee and Khare (2018) and they found that in 78% of them a positive relationship between CSR and financial performance came forward. This thesis will be based upon this scientific debate on whether CSR, with social innovations as part of CSR, leads to better financial performance.

For small and medium-sized firms an objective view of the overall performance is difficult, this should be narrowed down (Zulkiffli & Perera, 2011). Financial performance is a main area of outcome (Herciu & Șerban, 2018), this particular focus will be chosen for this thesis. The financial performance consists of revenues opposite of costs (Neely, 2002). Neely (2002) tried to specify this, 'revenue growth' and 'production costs' were mentioned as two major indicators. It seems clear that a firm intends to increase revenues and decrease costs. As mentioned before, Alonso-Martínez et al. (2019) found a positive relationship between social innovation and financial performance. Orlitzky (2011) also indicates a positive relationship between social innovations as part of CSR and financial performance. As a limitation, the author states that it is not necessarily a significant relationship and it is not clear in what direction the variables influence each other (Orlitzky, 2011). The categories established by Volberda et al. (2013) did mention the influence on productivity and its costs and revenue growth. Still, not a lot of research has been conducted on the specific relationship of social innovations with revenue growth and production costs. This shows the potential to specify research, so for this thesis, the choice has been made to focus on this area.

To measure the influence of these social innovations a certain group will be researched. An industry that does have a lot of responsibility questions raised is the manufacturing industry, as this industry is not seen as socially responsible (Ingarao, 2017). This industry is interesting as it perhaps has very recent social innovations to become more socially responsible or has a variety of opportunities to do so in the near future. Tucker et al. (2007) also mention that firms with a profit focus have a lot of potential to improve through social innovations. This industry has different sectors so by using an industry-wide view more valid results can be obtained. The focus will be on Dutch firms, as this is the most feasible option for this thesis. To summarize, this thesis focuses on the influence of social innovations on the financial performance of Dutch firms in the manufacturing industry.

1.2   Research question

The main problem for this thesis has been formed based on the motives and debate mentioned. This thesis aims to contribute to existing scientific knowledge and tries to add on new knowledge about social innovations. This objective will be met with the help of a research question. All the underlying parts of this thesis are focused on answering the following research question: *What is the influence of social innovations on the financial performance of Dutch firms in the manufacturing industry?*

To answer the research question some sub-questions are drawn. These sub-questions are carefully chosen to make sure they work towards answering the research question.

1. *What kind of social innovations are part of CSR-policies at Dutch firms in the manufacturing industry?*
2. *To what extent do social innovations introduced by Dutch firms in the manufacturing industry influence revenue growth and how to explain this influence?*
3. *To what extent do social innovations introduced by Dutch firms in the manufacturing industry influence production costs and how to explain this influence?*

When stating the scientific debate and research motives in the introduction some interesting things came up. The literature showed that a lot of firms do not have a policy for social innovations and therefore it is not a common practice (Heerwagen, 2010). With the use of the categories of social innovations (Volberda et al., 2013), different social innovations can be found and categorized. The first sub-question is henceforth focused on finding which social innovations are present at the Dutch firms in the manufacturing industry. Moving on to question two and three, the aim is to find the influence of social innovations on specific performance indicators. With sub-question two the focus will be on the influence on revenue growth. Answering this question helps to find out if and how revenue growth is affected and how to explain this. The same goes for sub-question three, but with a focus on production costs. In the theory, financial performance was mentioned by several authors but there was no real consensus yet. By narrowing down financial performance into the two indicators mentioned this thesis can contribute to scientific knowledge. Next to scientific relevance, this thesis also has practical relevance. Gaining knowledge could allow the observed firms to improve their financial performance in practice with the use of social innovations, as some recommendations could be given. There will also be a possibility to do further research within this field if this thesis is not sufficient. After drawing up a conclusion for this thesis a discussion can be started about the results. The full reading guide of this thesis will be shown in the next section.

1.3 Reading guide

Following up on this first section, the theoretical framework will be established. This section will consist of several separate parts. To start, the key concepts are further elaborated. With describing these a clear overview comes up, research can be built upon this. After doing this, the specific relationships between the concepts will be formed. These relationships will be based upon theory and empirical studies. After forming some hypotheses, a conceptual model is formed and visually shown.

After the theoretical framework section, the methodology of this thesis will be explained. To make sure the right information is found there will be two separate sources of information. The European Manufacturing Survey (EMS) will be used, this survey gains insight into Dutch manufacturing firms and their work. Next to this quantitative data, some qualitative data will be conducted. At several firms in the manufacturing business, a semi-structured interview will be held with an employee of the respective firm. A deeper understanding of how the actual research design looks will be given and certain choices about population and research methods will be elaborated. A table will be shown after operationalizing the key concepts. The validity and reliability of this thesis will be explained to make sure the best results are conducted when analyzing the data. A small section on the ethics of this thesis rounds off the methodology section.

To end this thesis two results sections will be formed. The results will be split up into a quantitative and a qualitative part. With all the data used a clear overview can be formed. Here, the hypotheses can either be supported or be rejected. With these results, the last step is to draw a conclusion and start a discussion about this conclusion. The research question will be answered in the conclusion and what this answer means will be analyzed. Lastly, a discussion will be set up to be able to give recommendations and look at the limitations of this thesis.

2.   Theoretical Framework

This section will form and explain the theoretical framework on which this thesis will be based. The most important key concepts will be defined and explained. It starts with giving a solid foundation on the dependent variable 'financial performance'. This leads to a specification of financial performance into two indicators: 'revenue growth' and 'production costs'. Next up, the variable 'CSR' will be narrowed down into the independent variable of this thesis: 'social innovations'. Social innovations will be explained and some categories of these innovations are discussed. After explaining the key concepts their relationship towards each other will be discussed. The relationships are established with the use of prior research, leading to certain hypotheses. To end this section, there will be a conceptual model given where the hypotheses will become visual.

2.1   Financial performance

In earlier research, a lot of different measurements have been used to define business performance. Lawrence (2016) for example used financial performance, Del Mar Miras-Rodríguez et al. (2020) used firm reputation and Juščius and Snieška (2008) used firms' competitive abilities as measurement. These differences show multiple options to use which makes it hard to compare results. Overall performance will be difficult to measure, as it is a very subjective concept, and it could be influenced by multiple factors (Herciu & Șerban, 2018). For this thesis, a specification will be used to try to measure certain effects with the use of performance indicators.

Business performance has three main areas of outcomes: 'financial performance, product market performance and shareholder return" (Herciu & Șerban, 2018; Richard, Devinney, Yip & Johnson, 2009, p. 103). Zulkiffli and Perera (2011) mentioned before that for small and medium-sized firms an objective view of the overall performance is difficult. Neely (2002) made a start as well and narrowed business performance down into multiple perspectives. The accounting perspective, focused on financial performance, is mentioned as an important one (Neely, 2002). With the use of prior research, the focus here will be on financial performance. In the accounting perspective by Neely (2002) 'revenue growth' is a major indicator. Revenue growth is explained as; 'the increase or decrease in a company's sales from one period to the next, shown as a percentage, which illustrates the increases and decreases over time identifying trends in the business' (Business Literacy Institute, 2021). Herciu and Șerban (2018) did also mention revenue growth as a big factor when determining financial performance. The findings suggest that to fully analyze and compare financial performance many more factors could be considered, but revenue growth is an important aspect (Herciu & Șerban, 2018). Finance and accounting work mostly divide financial ratios into classes as well (Delen, Kuzey & Uyar, 2013). So, revenue growth will be used in this thesis as a financial performance indicator.

As Neely (2002) stated, financial performance consists of revenues opposite of costs. With revenue growth falling into the first category a first performance indicator is found. For Neely (2002) it is important to make sure a firm generates revenues that exceed its costs. Within the category of costs, the estimation of these costs consists of several parts. Finding and using differences in the estimation of costs helps to give useful insight into the design of a firm's production process (Borenich, Greistorfer & Reimann, 2019). With the use of production costs, the most important part of the production process can be measured on a detailed level (Borenich et al., 2019). In economics, the production costs are defined as; 'the expenditures incurred to obtain the factors of production such as labor, land, and capital, that are needed in the production process of a product' (Corporate Finance Institute, 2015). Andersen (2010) describes production costs in terms of resource savings and productivity. With the use of resource efficiency, the total cost of production can be affected (Andersen, 2010). Innovations are seen as a vital part for firms to survive as it enhances production processes, enables the production of products in larger quantities and decreases the cost of production (Ahmad, Khattak, Khan & Rahman, 2020). For this thesis, production costs will be used as the second financial performance indicator.

In this thesis, when 'financial performance' is mentioned, it will be indicated by 'revenue growth' and 'production costs' of a firm. When looking at these indicators it seems logical that a firm wants revenue growth to steadily increase and production costs to be as low as possible. The assumption could be made that these developments should then lead to better financial performance and therefore better business performance. Further on in this section, the relationships between the key concepts will be established to see if this assumption is followed up by theory and empirical studies.

2.2   CSR and social innovations

Now that the financial performance is narrowed down the focus can be on the influencer of the revenue growth and production costs. As mentioned in the introduction, CSR-studies are emerging and these studies have different approaches (Jamali & Karam, 2018). CSR is described in this thesis as the way a firm integrates social, environmental and economic aspects into their values, culture, decisions, strategy and business operations (The Institute of Internal Auditors, 2010). As this description shows, it is a term with multiple aspects. Literature is slowly using CSR as a specification of total sustainability (Alshehhi et al., 2018). For this thesis, the choice has thus been made to narrow CSR down into a specific type of innovation. Volberda et al. (2013) mentioned social innovations as a key part of CSR. The authors explain these as 'innovations based on better use of technological knowledge and the increase of innovation power, productivity and competitiveness' (Volberda et al., 2013, p.6). In addition, social innovations, according to Volberda et al. (2013), might positively affect the firm surroundings, sustainability and society. Alonso-Martínez et al. (2019) contend that these types of innovations are introduced by firms that intend to contribute to environmental or social

renewal. With these social innovations, they want to improve the quality of life for society and sustain economic benefits for their firm (Alonso-Martínez et al., 2019). Tucker et al. (2007) mention that within CSR-policies social innovations as well as technological innovations are vehicles for advancement. As social innovations are a lesser-known subject in business and technology this will be the focus point (Tucker et al., 2007). The distinction between social and technological innovations takes a central place in this thesis. Although the focus will be on social innovations, the technological innovations will not be completely forgotten, the technological innovations will be used as a control variable later on, which will be explained in the operationalization in the methodology section.

With the specification of CSR into social innovations, an important key concept is given. In the most general way, social innovation refers to 'the generation and implementation of new ideas about how people should organize interpersonal activities, or social interactions, to meet one or more common goals' (Mumford, 2002, p. 253). This definition seems clear, but it is not specified in the business industry. Mumford (2002) mentions that social innovations involve the creation of new processes and procedures for structuring work. Next to this, social innovations could contribute to the development of new business practices (Mumford, 2002). Social innovations can for example be the development of new management skills, the realization of high-quality relationships or co-creation (Volberda et al., 2013). The literature on CSR is finally focusing more on the social dimension (Alshehhi et al., 2018). With this statement by Alshehhi et al. (2018) the relevance of this thesis is becoming apparent once again. Another emerging view in business and management literature is that the creation of economic value is not necessarily separate or at odds with social value creation by firms anymore (Van der Have & Rubalcaba, 2016). Hereby, the authors mention that social innovations take on a bigger role to reach financial performance (Van der Have & Rubalcaba, 2016).

As social innovation is an overarching term for several different innovations, a categorization has been made by multiple authors. With the use of categories, firms can split up their innovation practices and determine for themselves which category reaches the best results. Hochgerner (2011) tried to categorize social innovations, but with a slightly different approach than others. 'Relations', 'norms' and 'values' are all categories of social innovations, this typology is said to go beyond the business sector (Hochgerner, 2011). With these categories, Hochgerner (2011) links roles of individuals and fundamental values in social systems, whereby this can be used to identify different social innovations. The underlying categories of social innovations mentioned in the first section were established by Volberda et al. (2013, p.6), they categorized social innovations into; 'flexible organizing', 'dynamic management', 'working smarter' and 'co-creation'. Using these categories allows splitting up social innovations and putting them in a respective category. Flexible organizing are innovations based on the use of innovative organizing forms (Volberda et al., 2013). Examples are a newly introduced divisional structure or separating employees into teams to work on certain projects

(Volberda et al., 2013). The category of dynamic management consists of the development of new management skills and passing these skills on (Volberda et al., 2013). This category is also about sharing knowledge and training employees (Volberda et al., 2013). The third category about working smarter wants to realize high-quality work relations in a firm (Volberda et al., 2013). This category seems the broadest as working from home can for example be put into this category. The last category by Volberda et al. (2013) is about co-creation, which consists of working together in a firm. Within this category, an example can be dealing with mutual communication between firm departments and getting people on the same track (Volberda et al., 2013). With the use of several categories, this thesis can, with the use of sub-question number one, find out what kind of social innovations are present and eventually find out to which results they contribute.

To summarize, social innovations in business can be seen as solutions that lead to new opportunities and relationships, while at the same time aiming for better use of resources and means, while keeping social needs in mind (Cavazos-Arroyo, 2020). With the given categories and examples, it can be justified to relate innovations to certain social innovation categories. How this is operationalized will be explained in the methodology section.

2.3   Causal relationships

In the upcoming section, the elaborated key concepts are put in perspective to show how they relate. Here, the focal point will be on former empirical research to come to substantiated relations. The chosen empirical studies are based on their relatively similar approach to what this thesis tries to accomplish, to research the influence of social innovations on financial performance. Although these earlier studies might not all fully fit this specific thesis, the relevant parts still give good value to come to certain hypotheses as several interesting results came up.

2.3.1   Social innovations and revenue growth

To start, Begonja, Čiček, Filip, Balboni and Gerbin (2016) researched innovation and performance determinants of small and medium enterprises (SMEs). The authors looked at SMEs that did introduce social innovations and tried to compare these with SMEs that did not introduce social innovation or did no innovation at all (Begonja et al., 2016). The presence of social innovations was determined with the use of four yes or no survey questions about product improvement with a societal objective, the organization method related to the firm's mission, environmental footprint concern when improving products and reinvestment to reach a societal, environmental or community objective (Begonja et al., 2016). This research contained 841 firms in the Adriatic region in Europe, which were divided into three categories: primary product firms, production firms and service firms (Begonja et al., 2016). A survey with a seven-point Likert scale was used with a focus on five performance

14

indicators (Begonja et al., 2016). Begonja et al. (2016) show that SMEs with social innovations perceive a higher business performance than competitors with no social innovations. The production firms scored higher than service firms on the profit indicator (Begonja et al., 2016). The authors indicated for example that exporting grew for SMEs with social innovations because of improvements, so the profit indicator showed better financial performance (Begonja et al., 2016). From these results, it can be assumed that revenue growth is positively affected by social innovations, as revenue growth can be seen as part of the profit. Revenue growth was not directly mentioned so this should be taken into account.

Research by Cavazos-Arroyo (2020) focused on the effects of social innovation capability and enterprise social performance as part of value creation in social enterprises. Here, 106 social enterprise managers in Mexico took part (Cavazos-Arroyo, 2020). By using structural equation modeling using partial least squares, hypotheses were tested (Cavazos-Arroyo, 2020). Social innovation was measured with a seven-point Likert scale to see the capability of firms to produce value with a focus on social needs instead of just financial profits (Cavazos-Arroyo, 2020). In the results, Cavazos-Arroyo (2020) mentions that social innovation capability has a positive effect on value creation. A direct and indirect effect was found and Cavazos-Arroyo (2020) showed that value creation tremendously benefits from social innovations because social needs can be met with the use of their resources, capacity and time. With these results being the most relevant, the assumption could be made that revenue growth can be part of value creation. So, revenue growth would be positively influenced by social innovation capability. A side note here is that this study is focused on social enterprises, which is a different type of firm compared to firms in the manufacturing industry.

Cavazos-Arroyo (2020) did not specifically focus on the manufacturing industry in his study. Studies that have a focus on this industry might contribute more to substantiating relevant causal relationships. Gunday, Ulusoy, Kilic and Alpkan (2011) tried to explore the effect of organizational, process, product and marketing innovations on firm performance. Hereby, the firm performance of manufacturing firms was indicated by innovative, production, market and financial performances (Gunday et al., 2011). 184 manufacturing firms in Turkey received questionnaires and several face-to-face interviews were conducted at these firms (Gunday et al., 2011). The type of innovation was determined with the use of a five-point Likert scale, based on the type of practice and application (Gunday et al., 2011). The results show the positive effects of innovations on business performance, especially the innovative and financial performance (Gunday et al., 2011). As shown, sales went up, which led to more revenue (Gunday et al., 2011). With innovation, the production can be improved and with the improved efficiency, sales and ultimately revenue go up (Gunday et al., 2011). A side note here is that the authors do not specifically speak about social innovations, but it can be seen as a part of organizational, process or product innovations here.

As the study by Gunday et al. (2011) shows, social innovation is not mentioned as a specific innovation category in a lot of studies. Azar and Ciabuschi (2017) try to research this category in practice, but they use the term 'organizational innovation'. The objective is to find the relevance of different types of organizational innovation for firm performance (Azar & Ciabuschi, 2017). Organizational innovation[1] is assessed with the use of a five-point Likert scale measuring both extensiveness and radicalness (Azar & Ciabuschi, 2017). 218 ventures in Sweden are participating and with structural equation modeling with partial least squares, the authors want to come to results (Azar & Ciabuschi, 2017). With the results, Azar and Ciabuschi (2017) show that performance is both directly and indirectly influenced by organizational innovations. The controlling role of technological innovation is mentioned alongside organizational innovations, this is explained by the fact that organizational innovations enhance technological innovations (Azar & Ciabuschi, 2017). After conducting the analyses, the authors mention that change in the social system is mostly coupled with changes in the technical/operating system (Azar & Ciabuschi, 2017). An adoption of only one type of organizational innovation may not lead to the best positive effects on performance, as more extensive organizational innovation changes a firm more overall (Azar & Ciabuschi, 2017). The participating ventures are from the export industry, so the performance here is focused on reaching higher export numbers, which should lead to more revenue growth (Azar & Ciabuschi, 2017). With reaching higher export numbers it will, for this thesis, be assumed that revenue will grow.

As these prior studies show positive effects on financial performance, the overall assumption could be that social innovation implementation leads to an increase in revenue growth. Su et al. (2020) came to different conclusions. They tried to investigate the effects of CSR dimensions on financial performance across multiple sectors in China (Su et al. 2020). With the use of 568 Chinese firms' year observations from 2008 to 2017, a huge database was conducted (Su et al. 2020). Financial ratings such as firm profitability were used to compare firms (Su et al. 2020). The authors started a multiple regression analysis, after quantifying CSR expenditures into dimensions by comparing year observations. In the results, Su et al. (2020) show negative results on some CSR-dimensions for the manufacturing industry. With the results Su et al. (2020) show that the manufacturing industry does not necessarily benefit from CSR-innovations, this is shown in the firm profitability. A possible explanation given is the high costs to adapt and the heavy reliance on 'bad' resources (Su et al., 2020). The authors do also link the results with the state of the Chinese economy, which they define as emerging. For the Dutch manufacturing business, this is a different case.

---

[1] Literature showed that multiple concepts and definitions were used to describe roughly the same type of innovations. Social innovations (Begonja et al., 2016), organizational innovations (Azar & Ciabuschi, 2017), workplace innovation or work organization renewal (Pot, 2011) are some examples.

The core arguments from these studies tend to show a positive relationship between social innovations and revenue growth. Several empirical studies back this up, despite some of their differences in approach. Begonja et al. (2016) had good results on the profit indicator, but revenue growth was not directly mentioned. The study by Cavazos-Arroyo (2020) showed an increasing effect on value creation, but here a different industry was used. Gunday et al. (2011) had a specific focus on the manufacturing industry and showed positive results on revenue growth. Azar and Ciabuschi (2017) show increasing export numbers, but with technological innovation as a controlling variable. The final study by Su et al. (2020) showed negative effects on profitability. The studies show there is no perfect example for this thesis to take into account, but all the core arguments tend to show a positive relationship. The first hypothesis is thus constructed as follows:

H1: Social innovations in a firm have an increasing effect on the growth in revenue of a firm.

2.3.2   Social innovations and production costs

By forming the first hypothesis the first relationship has been established. In this section, a similar approach will be used. The focus is on production costs here. Using production costs as a performance indicator in this research area has not been done a lot. The chosen empirical studies do therefore just partly fit into this thesis.

Small-scale research in the United Kingdom by Hiteva and Sovacool in 2017 offers a critical perspective on the potential of business model innovation. With the use of four small-case businesses as case studies the contribution for supply chains and new impact in social innovations is researched (Hiteva & Sovacool, 2017). In this study, the distribution of costs and benefits can be embedded in business model innovations with the implementation of social innovations (Hiteva & Sovacool, 2017). Social innovations are determined and categorized based on their influence on energy savings (Hiteva & Sovacool, 2017). In the results, Hiteva and Sovacool (2017) mention a direct contribution of business model innovation regarding supply chains and new impact with the use of social innovations. The explanation for this result is that a concentration on existing skills, knowledge and social capital will lead to improvement of the supply chain, because of more efficient and smarter working (Hiteva & Sovacool, 2017). Within the supply chains production costs have been mentioned, but the authors do limit their research by saying that production costs are not the only important area in a supply chain (Hiteva & Sovacool, 2017). Another limitation is the few cases researched.

An additional study by Chen and Tebourbi (2020) looks at the relationship of CSR and innovation capital with business performance. Within this study 33 manufacturing companies in Taiwan were taken into account (Chen & Tebourbi, 2020). With the use of nonparametric statistical research and a Tobit regression analysis, a score on technical efficiency (TE) value is formed (Chen & Tebourbi, 2020). In the results, there is a relationship mentioned between CSR in general and TE, but it is not

significant (Chen & Tebourbi, 2020). Just nine of the 33 participating companies that introduced CSR were relatively efficient (Chen & Tebourbi, 2020). An explanation given is that their R&D departments have limited expenditures and this has led to inefficiencies because of too little resources and capital to switch to a CSR-policy (Chen & Tebourbi, 2020). This study shows that to become technically efficient in the manufacturing industry CSR does not have to be the best option to implement, but if it is implemented, do it fully and not just a little.

A third study focuses on the potential revenue opportunity of investing in CSR business model innovation (MacMillan, 2020). 61 companies in Canada participated and were compared using linear regression analysis (MacMillan, 2020). CSR business model innovation levels are determined with the use of Sustainalytics ESG-rankings (MacMillan, 2020). The overall focus is on potential and some interesting things come up. Here, a significant effect between CSR-innovation adoption and revenue as part of financial performance is found (MacMillan, 2020). Alongside revenue, there is an overall improvement in financial performance (MacMillan, 2020). MacMillan (2020) explains this by mentioning that CSR business model innovation leverages technology advancements which lead to lower costs and more efficiency, in the long run the sales revenue increases. This can thus be seen as a mediating effect, as the CSR business model innovation leads to cost reductions and efficiency increases through the leveraging of technology advancements. The author does not mention production costs specifically, but for this thesis, it will be assumed that 'improvement on financial performance' also means that the production costs are decreasing.

The three studies show more differences in results than in the previous section about revenue growth. The first study by Hiteva and Sovacool (2017) is a smaller study with some potentially positive results for the production costs. In the second study a weak CSR reaction on technical efficiency was found (Chen & Tebourbi, 2020). The third and final study shows a positive reaction of CSR-innovations on financial performance (MacMillan, 2020). As mentioned before, the focus on production costs has not been a focal point of research yet and this is showing. The results show some promise, but it is more focused on the influence of CSR in general on the (financial) performance. Although these results might not fully fit, some tendencies can be made up. From the core of this empirical research, it can be assumed that CSR-innovation, in general, has a decreasing effect on costs, but not always directly. Social innovations are of course an underlying part of CSR-innovation so therefore the assumption is thus that social innovations also have a decreasing effect on costs.
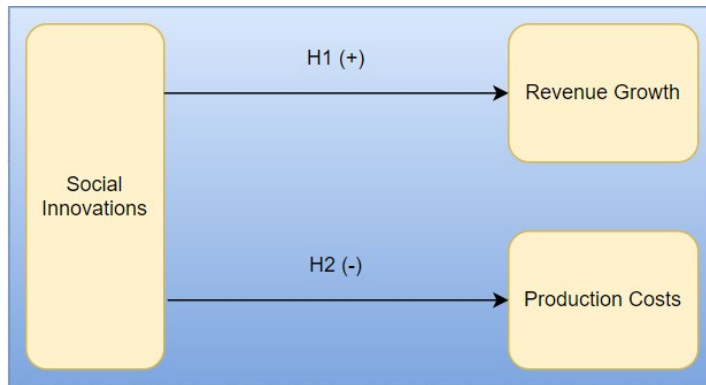
When looking at more theoretical-based research, Alshehhi et al. (2018) did review 132 top-tier papers and found that in 78% of them a positive relationship between CSR and financial performance came forward. Other authors do define social innovations as the main booster of productivity and lowering costs is part of this productivity (Volberda et al., 2013). The understanding of the empirical studies and theory gives the possibility to draw the mentioned assumption. Because of the lack of

research on social innovation and production costs, more empirical research would be necessary here. To sum this section up, hypothesis two is constructed:

H2: Social innovations in a firm have a decreasing effect on the production costs of a firm.

2.4 Conceptual model

In this figure, the conceptual model of this research is shown. Both estimated hypotheses are visible. Hypothesis number one states the increasing effect of 'social innovations' on 'revenue growth'. Hypothesis two shows the decreasing effect of 'social innovations' on 'production costs'. Both hypotheses are carefully established by theory and empirical research in the last section.

3.   Methodology

In this section, the methodology of this thesis will be discussed. To start, the research method and the chosen population are elaborated. Following up, the operationalization of this thesis will explain the dependent, independent and control variables. Hereby, an operationalization table will be shown as well. Subsequently, this section touches upon the validity, reliability and analysis methods of this thesis. Lastly, the research ethics will be shortly reported.

3.1   Research method and population

For this thesis, there will be a combination of quantitative and qualitative data to come to a sufficient answer to the research question. With the use of quantitative data, multiple firms can be taken into account. The data is obtained via a survey conducted at several firm factories. This data can benefit to a certain high, as the data is very specific and coming from multiple firms. A bigger audience is reached with the use of a survey (Bleijenbergh, 2015).

Alongside this quantitative data, this thesis has reached out to some firms in an attempt to receive qualitative data. To reach the objective of this thesis, qualitative research can tremendously contribute, as the objective is to contribute to scientific knowledge as well as adding on new knowledge. As the objective focuses on phenomena in practice, it is part of qualitative research (Bleijenbergh, 2015). Within qualitative research, an interview study is an option (Bleijenbergh, 2015). With the use of several interviews, social innovations in firms are researched. With the use of both qualitative and quantitative research, a mixed-methods strategy is acknowledged. This thesis aims to do practical research based on the theoretical framework built in the last section. This is called a deductive approach, as the approach goes from 'general towards the specific' (Vennix, 2016, p. 39). With the use of mixed-methods research a more complete picture can be formed (Bleijenbergh, 2015).

The quantitative data in this thesis was acquired through the European Manufacturing Survey (EMS). This survey focuses on gaining insight into firms in the manufacturing industry and their efforts towards modernization and sustainability. The survey consisted of questions on multiple concepts, examples are innovation approaches or environmental intentions. Access to the EMS was organized by the Radboud University in Nijmegen. A recent edition (2015) of the Dutch version of the EMS will be used and the participating firms were contacted via the researchers who conduct the EMS. The participants are based on the size of the firms, their sector and their activities.

The interviews were conducted at several Dutch firms in the manufacturing industry. The participating firms were part of the network of the author of this thesis. The firms are chosen because of their profit point of view and their identity as a manufacturing firm. McNamara (2005) describes a firm focused on profit as a firm formed to make a profit, to earn a higher amount of money than is

spent. Hereby, an opportunistic sample is used, as Boeije (2014) describes this as a sample with easily accessible participants. The interviews were semi-constructed and conducted after analyzing the EMS. With this style of interviewing the overall form is clear and there are possibilities to dive deeper into a specific answer. Small changes of the interview questions could have been adopted in the later interviews in case of insufficient answers in the prior interviews, this is part of the cyclical process, a big part of qualitative research (Boeije, 2014).

The unit of research is a specific factory, which is one of the locations of that respective firm. Although a firm might have multiple factories, other factories will not be taken into account, the focus is on a specific location. For the unit of observation, the respondents who took part in an interview are used. For the EMS, the person who filled in the survey is the unit of observation, this would mostly be an employee high up in the hierarchy at that specific location.

3.2   Operationalization

In the theoretical framework, the key concepts were thoroughly explored. When looking at the EMS-data, the key concepts can be conceptualized. 'Social innovations' is the main concept of this thesis. In the EMS, this will be described as the number of social innovations applied. The EMS-questionnaire is filtered and several questions can be of use to find specific types of innovation. In the EMS-data, the mentioned social innovation categories by Volberda et al. (2013) can be identified. An innovation shown in the EMS can be related to a respective social innovation category. In appendix A, question 3 from the EMS will be used for the social innovations, there are 18 innovations mentioned which could be present or not. This will contribute to answering sub-question one of this thesis. Looking at the dependent variables two concepts are accounted for, 'revenue growth' and 'production costs'. Both will be shown as a trend variable. Trend variables are favored here over fixed variables as trend variables show a percentage of growth or decline which gives a clearer overview of influence for this thesis. Revenue growth can be calculated by looking at percentual differences between annual turnover, production costs is calculated by looking at the percent change of production costs per unit in 2014. The percentages can be used to give a detailed overview. Furthermore, the interview questions can be focused on these indicators as well. The dependent variables help to construct answers to sub-questions two and three of this thesis.

When conducting this research some control variables will be taken into account as well. Coming from the theoretical framework, authors spoke about technological innovations next to social innovations (Tucker et al., 2007). To isolate the effects of social innovations, this thesis will control for the use of technological innovations. Question 8.1 in the EMS-questionnaire (Appendix A) will be used for this control variable, there are 23 different innovations mentioned which could be present or not. Another control variable will be the firm size, as firm size might influence the ability to innovate.

The participating firms of the EMS are already on a specific level of employees to be accessible to enter the survey. The firm size will be based on the number of employees. A final control variable will be the industry type. As the manufacturing industry is an overarching name for multiple smaller sectors the differences between these sectors could influence the results. The diversity of these sectors could go hand in hand with a diversity of innovations. From this reasoning, the type of industry is taken into account as a control variable. The table below shows the operationalization graphically.

Table 1: Operationalization

Variable type	Variable name	Description of item	Min	Max	Measurement level	Appendix, question nr.
Independent	Social innovations	Different social innovations applied	0	18	Ratio	A, 3
Dependent	Revenue growth	Percentual difference in annual turnover (2012-2014)	$-\infty\%$	$\infty\%$	Ratio	A, 21
	Production costs	Percentage change in production costs per product unit in 2014	$\leq$-10%	$\geq$10%	Ordinal	A, 12
Control	Technological innovations	Different technological innovations applied	0	23	Ratio	A, 8.1
	Firm size	Number of employees	10	∞	Ratio	A, 21
	Industry	Industry type	-	-	Nominal	A, 1.2

3.3   Validity, reliability and analysis methods

With the use of a mixed-method strategy, the validity of this thesis should reach strong results. The research question will be answered with the help of a wide variety of data. The EMS-data is considered a strong and valid database, as it has been around for several years and multiple editions were conducted. The themes surveyed in the EMS consist of multiple factors deemed important for this thesis. Innovation is measured which comes back as the independent variable 'social innovations'. The dependent variables of this thesis are also a significant part of the quantitative data. Technological innovations are part of the EMS as well, which can be used for the control variable. The Cronbach's Alpha will be used to test consistency and reliability between researched items in the EMS, this will be necessary to guarantee the internal consistency and reliability.

In the interviews, the semi-constructed approach leads to specific in-depth information which benefits this thesis majorly. As the results come from an insider higher up in the hierarchy of the respective firms, the information can be seen as reliable. With the validity and reliability on a high level, the overall research quality reaches a significant level. The cross-validation between EMS-data and interview data improves reliability as well. A side note is that the interviews are harder to generalize, despite different aspects taken into account. To a certain high, the results are generalizable, but the small number of interviews has its impact.

Both the qualitative and quantitative data will be analyzed separately first. The EMS-data will be analyzed via SPSS. As mentioned, Cronbach's alpha will be conducted to test consistency and reliability. The EMS-items showing the presence of social innovations can be related to the categories mentioned by Volberda et al. (2013). The frequencies of the items will show which social innovations are applied most, this will benefit answering sub-question one. The possible relationships between the key concepts will be analyzed with the use of two regression analyses. A regression analysis seems suitable here as this tests independent variables in relation to a dependent variable (McClave, Benson, Sincich & Knypstra, 2011). With the establishment of these relationships, the second and third sub-question and ultimately the overarching research question can be answered. All the assumptions of the analysis methods will be taken into account and be tested for, these assumptions are based on Hair, Black, Babin and Anderson (2014).

The interviews will be transcribed and coded. The coding of a transcript is based upon the key concepts and their indicators. For example, answers linked towards revenue growth can be highlighted and put into this category. As for the deductive approach of this research, the concepts and indicators came from the theoretical framework. As the interview questions are not planned to be an exact replica of the EMS-questions, not all the EMS-items will be directly questioned in the interviews. In the interview questions (Appendix K) it is shown how the EMS-items and the social innovation

categories come back. Because of the Covid-19 restrictions in the Netherlands, which mention working from home and keeping the number of people at a firm as low as possible, the interviews will be conducted via Zoom, despite the initial idea to do this face-to-face. Vennix (2016) does, however, mention that face-to-face interviews are not necessarily a more valid interview method than a long-distance interview.

3.4   Research ethics

The research ethics of this thesis are based on several principles. All the participating firms were informed before they participated in the EMS or the interviews about the study they were participating in. By giving all the relevant information about the EMS the firms knew what they were permitting for and accepted the collection and processing of their answers. The relevant information given to the interview respondents was specifically focused on this thesis; the subject, the objective, the role of the respondent and the consequences were all communicated. The interview respondents were treated respectfully and they were in no way forced to answer certain questions. By doing this the respondents were in no way at risk or harmed. They were aware of the fact their answers were recorded and agreed to the fact they were used for this thesis only. For the EMS, the participating firms received the results to make sure they could compare their firm with others.

The participating firms in the EMS were not connected to the author of this thesis. There was no conflict of interest and no biases between firms and the author. All the findings could be presented undistorted. For the interviews, the respondents were chosen from the network of the author of this thesis. Although they were chosen this way, they were in no other way connected. Biases and conflicts of interest were therefore not present. All the firms and respondents were treated anonymously and confidentially. The information is not identifiable towards a specific respondent or firm. The data is privacy protected to make sure specific information does not fall into wrong hands.

4.   Quantitative results

In this section, the quantitative results of the analyses will be described and discussed. With the use of the EMS, the hypotheses can be tested. This section starts with looking at the response data and the variable construction. Following up, an univariate and a bivariate analysis will be shown in a table plus explanation. A multivariate analysis will be done with the use of two regression analyses, this will benefit testing and discussing the hypotheses of this thesis. A brief summary of the most important results will conclude this section.

4.1   Response data

The 2015 edition of the Dutch EMS consisted of 177 firms. It is important for this thesis to look at how these firms score on firm size and in which type of industry they operate. Table 2 shows the mode of the firm size is between 20 to 49 employees, with a frequency of 74. The frequencies also show that most of the 177 companies have less than 100 employees, so there are more 'small' firms in the database.

Table 2: Sample distribution for Firm Size Industry

Table 3: Sample distribution for Type of Industry

Number of Employees	Frequency
< 20	37
20 - 49	74
50 - 99	43
100 - 249	19
> 250	4
Total	177

Type of Industry	Frequency
Metal	37
Food	18
Textile	22
Construction	13
Chemical	22
Machinery	31
Electronic	32
Total	175

The type of industry is another variable which can have its influence for this thesis. When looking at the EMS-data, 175 of the 177 firms filled in their industry type. This results in the fact that for the type of industry 175 firms were valid. In table 3 the sample distribution is portrayed. The frequencies of the types of industry are fairly distributed, every industry is represented. The metal industry has the largest frequency, with a score of 37. The food and the construction industry score the lowest, with scores of respectively 18 and 13. The total of course adds up to 175.

4.2   Variable Construction

After checking the response set, the next step is to describe the most important variables. Social innovations are the independent variable, revenue growth and the production costs are the dependent variables. Another important variable is the control variable of technological innovations. In this section these variables will be described and tested to make sure they are fitting for the analyses.

The independent variable 'social innovations' is described in the operationalization table as the 'different social innovations applied'. On the basis of Volberda et al. (2013) in this investigation social innovation in a firm is understood as flexible organizing practices (e.g. temporary or project teams), dynamic management practices (e.g. new skill development and knowledge sharing), smart working practices (e.g. job enrichment) and co-creation practices (e.g. teamwork). In the EMS, survey question number three focuses on organizational practices (Appendix A). So, the EMS consists of 18 items on which the social innovations can be measured. The items can be related to the Volberda et al. (2013) categories. As sub-question one has a particular focus on the social innovations present, this part of the EMS will be valuable regarding this sub-question. The internal consistency and reliability of these items need to be measured to make sure they are valid. Table 4 shows that the social innovations have a Cronbach's Alpha of 0.800. This score is well above the value of 0.600, which Hair et al. (2014) mention as acceptable. So, the items used here are internally consistent and reliable. If item 16 or 18 are deleted the Cronbach's Alpha can be increased to respectively 0.801 or 0.802 (Appendix B). Hair et al. (2014) mention that only if the Cronbach's Alpha increases with more than 0.05, an item should be deleted from the database. Both item 16 and 18 will remain in the database, as deleting these items could potentially hurt the rest of the analysis.

Table 4: Cronbach's Alpha Social Innovations

Cronbach's Alpha	N of Items
,800	18

After looking at the independent variable, the focus now shifts towards the dependent variables of this thesis. First, revenue growth will be described. In the EMS-database the 2012 and 2014 annual turnover of firms are questioned. As this thesis focuses on the growth of revenue this difference in turnover will be measured as a percentage. A new variable 'RevGrow' was computed, this variable took the difference in annual turnover between 2014 and 2012, divided this by the annual turnover of 2012 and multiplied this by 100, to get a percentage score. For revenue growth, there are 146 valid cases and -41,18% is the 'min-score' and 71,30% is the 'max-score'.

The other dependent variable focuses on the production costs. As shown in the operationalization table, question 12 of the EMS measures production cost changes (Appendix A). In the database this results in the 'percentage change in production costs per product unit in 2014'. The valid cases were measured with the use of categories. In table 5 it is shown that 78,6% of the firms have a percentage change between -5% and 5%. The mode is in the category of -5% to 0%, with a frequency of 54. This shows that a lot of firms are around a stable percentage change, with a slight edge towards -5% or 5%.

Table 5: Percentage change in production costs per product unit in 2014

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< -10%	6	3,4	3,4	3,4
	-10 to -5%	15	8,5	8,5	11,9
	-5% to 0	54	30,5	30,5	42,4
	stable	41	23,2	23,2	65,5
	0 to 5%	44	24,9	24,9	90,4
	5% to 10%	15	8,5	8,5	98,9
	> 10%	2	1,1	1,1	100,0
	Total	177	100,0	100,0	

The control variable 'technological innovations' will be discussed next. This variable is described as 'different technological innovations applied'. This variable will be approached similarly as the social innovations variable. In the EMS, question 8.1 focuses on technological innovations (Appendix A). There are 23 different items and these will be tested on internal consistency and reliability. The technological innovations have a Cronbach's Alpha of 0.715, as shown in table 6. This value is above the acceptable value of 0.600, as given by Hair et al. (2014). This value is somewhat lower than at the social innovations, so the item total statistics were analyzed (Appendix C). There, it is shown that by deleting items 5 and 9 the Cronbach's Alpha could increase, but so minimal that they were not deleted. Item 7 can increase the Cronbach's Alpha to 0.721, which is an increase of 0.06, this is just above the 0.05 Hair et al. (2014) mention. The choice was made not to delete this item, as the increase is very small and deleting a variable could potentially hurt the analysis. Therefore, all the items will remain in the database.

Table 6: Cronbach's Alpha Technological Innovations

Cronbach's Alpha	N of Items
,715	23

4.3   Univariate analysis

In this section, an univariate analysis is given and shown in a table (table 7). The valid cases, mean, median, standard deviation, min-max, skewness and kurtosis are all taken into account. The non-metric variable of industry type is not present in table 7, the exact frequencies of this variable were shown earlier, in table 3.

All the items from EMS-question 3 (Appendix A) were put together in SPSS, they were then computed into a new variable 'Social Innovations Applied'. The mean is 8.01 and the standard deviation is 3.85, out of 177 valid cases. As these numbers show, not all the social innovations are applied by the participating firms. With a 'min-score' of 0, it is even shown that certain firms did not execute any of the social innovations. Still, a mean and median of 8 shows a fair amount of social innovations were applied. The exact frequencies in appendix D show which social innovations are applied most. An interesting observation of the frequencies is that from all the social innovations, innovations related to the 'working smarter' category got a lot of attention, namely item 4, 5 and 6 (Appendix B). The item with the highest frequency is item 2, the standardized and detailed working instruction, this item relates best to the 'dynamic management' category. It should be mentioned that for a lot of innovation items in the EMS, it is difficult to relate them to a specific category mentioned by Volberda et al. (2013).

Revenue growth is next, this variable shows a big gap between the 'min-score' and 'max-score', -41,18% and +71,30%. This shows that revenue growth of the participating firms does differ quite a bit. With a mean of 9.63, it shows that, on average, most firms increase their revenue by almost 10%. As mentioned before, there are less valid cases here as some firms did not fill in both the annual turnover of 2012 and 2014. Concluding, the revenue growth from 2012 to 2014, on average, is positive and it is normally distributed with a skewness of 0.29 and a kurtosis of 0.95.

The other dependent variable focuses on production costs. As shown before in table 5, 78,6% of the firms have a percentage change between -5% and 5%. The mode is in the category of -5% to 0%, with a frequency of 54. This shows that a lot of firms are around a stable percentage change, with a slight edge towards -5% or 5%. The table also shows that 42.4% of the firms did decrease their production costs in 2014. As shown in table 7, the mean is 3.88 and the standard deviation is 1.28. The skewness and kurtosis score respectively 0.095 and -0.517, which is well within the acceptable range of -3 to +3 (Hair et al., 2014). So, it can be concluded that, on average, a decrease in production costs is visible for the participating firms. These production cost results are from the year 2014.

The first control variable looks at the technological innovations. The mean of the technological innovations is 4.62 with a standard deviation of 3.17. The mean is significantly lower as for the social

innovations. As well as with the social innovations, a lot of firms did not nearly execute all the technological innovations. With a 'min-score' of 0, it portrays that some firms did not even apply one of the innovations. The kurtosis is 2.22, which is just below the acceptable range of +3. The exact frequencies of which technological innovations are applied can be found in appendix E. Here, it is shown that a lot of items have a very low frequency score.

The control variable of firm size presented some difficulties, as this variable caused a major violation of the acceptable skewness and kurtosis range of -3 to +3 (Hair et al., 2014). A logarithmic transformation (log10) has been used to deal with this issue. As table 7 shows, the skewness scores within the acceptable range after the transformation, with a score of 1.49. The kurtosis does however still score too high, 5.744. This is not seen as a major problem for this thesis, as the score is not extremely far from the +3 boundary. In conclusion, the normality of firm size could still be assumed.

Table 7: Univariate Statistics[2]

Variable type	Concept	N	Mean	Median	St. Dev.	Min / Max.	Skew.	Kurt.
Independent	**Social innovations applied**	177	8.01	8	3.85	0 / 18	0.095	-0.517
Dependent	**Revenue Growth**	146	9.63	9.44	18.99	-41.18 / 71.30	0.29	0.95
	Production Costs	177	3.88	4	1.28	1 / 7	-0.029	-0.417
Control	**Technological innovations applied**	177	4.62	4	3.17	0 / 19	1.2	2.22
	Firm Size	177	1.60	1.58	0.40	1 / 3.89	1.49	5.744

4.4   Bivariate analysis

In this section the correlations between the variables will be tested. These variables should not be too highly correlated to each other, as this will decrease the unique variance of a variable explained by another variable. Hair et al. (2014) describes this as testing for multicollinearity between variables. For example, if a dependent variable correlates too much with an independent variable, there is a multicollinearity problem (Hair et al., 2014). All correlation values above 0.70 (Pearson R-value) can result in difficulties for analyses (Hair et al., 2014).

The bivariate statistics of this thesis (table 8) show no correlations between variables which are too high (above the 0.70 boundary). The independent variable 'social innovations' is not too highly

---

[2] Firm size is transformed with a log10 transformation

correlated with the dependent variables 'revenue growth' and 'production costs'. Overall, the bivariate statistics show there is no multicollinearity between the variables.

The bivariate statistics indicate certain relationships before the multivariate analyses later in this section. The first hypothesis of this thesis expected that social innovations would increase revenue growth. The relationship between these variables shows a negative non-significant value (r = -0.132, sig. = 0.113), this does not support the first hypothesis. Furthermore, there is a significant negative relationship between social innovations and production costs, r = -0.251, sig.= 0.001. This does show that social innovations have a negative effect on production costs, the production costs decrease as social innovations increase. The second hypothesis of this thesis expected that social innovations would decrease the production costs. So, this hypothesis is supported by the bivariate analysis.

There is a significant positive relationship between technological innovations and social innovations, r = 0.563, sig. = 0.00. This relationship does not seem surprising as the theoretical framework and empirical studies showed that these two are the major types of innovation for a firm (Tucker et al., 2007). It does show that the presence of social innovations can be explained by several technological innovations being present as well. If a firm is known for being innovative, it seems logical that both social and technological innovations are applied. Another observation which adds on to this is that 'firm size' does have two significant positive relationships, with both social innovations (r = 0.505, sig. = 0.00) and technological innovations (r = 0.522, sig. = 0.00). With these scores the assumption can be drawn that larger firms have more innovations applied and that firm size has a positive influence on the number of innovations applied.

Table 8: Bivariate Statistics

	Social innovations	Revenue growth	Production costs	Technological innovations	Firm size
Social innovations	1				
Revenue growth	-0.132	1			
Production costs	-0.251**	-0.04	1		
Technological innovations	0.563**	-0.073	-0.060	1	
Firm size	0.505**	-0.023	-0.061	0.522**	1

** significant at p < .01.

4.5   Multivariate analysis

After the univariate and bivariate analyses, this section will focus on the multivariate analysis. Doing a regression analysis deemed a valid option to test the hypotheses of this thesis. A first regression analysis is focused on the revenue growth, a second one is focused on the production costs. All the assumptions to perform a regression analysis are reviewed first. After conducting the actual analyses, the results will be discussed and the hypotheses are tested with the outcomes.

4.5.1   Assumptions regression analysis

Before checking the assumptions by Hair et al. (2014), the data is reviewed. An important aspect of the regression analysis is that data needs to be metric, if data is not metric it should be transformed to make sure it is valid (Hair et al., 2014). The industry type variable was recoded with a dummy variable. The reference category of this dummy variable is the 'metal' industry. Moving on, Hair et al. (2014) explain that four different assumptions should be met: normality, linearity, homoscedasticity and independence of the error terms. The first assumption of normality can be tested with a p-plot, in both the p-plots it is shown that the residuals do not differ drastically from the diagonal line, so normality is assumed (Appendix F). The linearity assumption can be tested by looking at a scatterplot (Hair et al., 2014). The linearity is visible in appendix G, the production costs scatterplot shows a clear linear relation, the revenue growth scatterplot is a bit more scattered but linearity can be assumed. To check whether homoscedasticity and independence of the error terms can be assumed, the scatter plots are useful as well. In these scatterplots there is not one place where all the dots are scattered, it can however be assumed there is a bit of a bias in the dots in the production costs scatterplot, whereas unbiased is preferred (Hair et al., 2014). As all the dots are scattered, the homoscedasticity can be assumed for both revenue growth and production costs (Appendix G). For the independence of error terms, the scatterplots can be checked to see if all the dots are within the -3 and +3 range on both axes (Hair et al., 2014). In both the scatterplots this is the case, independence of error terms is therefore assumed. Another option of checking the independence is looking at the Durbin-Watson coefficient. This value varies between 0 and 4, it should be around 2 to assume independence of error terms (Hair et al., 2014). As can be seen in Appendix H and I, the values are 2.237 and 1.879, which is both close to 2.

4.5.2 Regression analysis revenue growth

The first regression analysis is focused on the revenue growth of the participating firms. The outcomes are shown in table 9. It becomes clear that the model is not significant with an F-score of 0.956 and a significance of 0.479. The adjusted R square even has a negative score of -0.003. As this value shows which variance of the dependent variable is explained by the independent variables, a negative score is not a preferred outcome. It can be concluded that this model does not fit well with the EMS-data. The social innovations applied have a non-significant negative relationship with revenue growth (B = -0.919, sig. = 0.095). This non-significant value has come forward after controlling for technological innovations, firm size and type of industry. Every social innovation added will thus lead to a decrease in revenue growth. A possible explanation could be that social innovations take time to settle in or cost money to implement, the period of 2012 to 2014 could be too short of a period to see an actual difference in revenue. Revenue might drop first because of costs, in the long term social innovations could still have a positive influence on revenue growth. The study of Su et al. (2020), discussed in the theoretical framework, did mention high costs to adapt to an innovation dimension as well. Appendix I shows a more detailed look at all the outcomes of this first regression analysis.

The technological innovations applied have a non-significant positive relationship with revenue growth (B = 0.072, sig. = 0.912). This displays that these types of innovation have very little influence on the revenue growth. A possible explanation here could be that it could cost a lot of money to implement a technological innovation, this would then lead to fewer revenues in the short term. The firm size has a bigger influence on revenue growth, but not a significant one (B = 2,710, sig. = 0.585). This shows that larger firms have more revenue growth, as the relationship is positive. The last control variable is the type of industry. In table 9, it becomes clear that there is a lot of difference between the industry types. Scores between 9.039 (food) and -7.731 (construction), show a big gap between all the industries. None of the industries does have a significant relationship with revenue growth.

With the results of the first regression analysis, hypothesis one will be rejected. Social innovations applied by a firm do not have a significant increasing effect on the growth in revenue of a firm, it does have a non-significant negative effect.

Table 9: Regression analysis revenue growth

	Revenue growth
	B (SE)
Independent variable	
1. Social innovations applied	-0.919 (0.095)
Control variables	
2. Technological innovations applied	0.072 (0.912)
3. Number of employees	2.710 (0.585)
4. Food	9.039 (0.134)
5. Textile	-1.001 (0.864)
6. Construction	-7.731 (0.236)
7. Chemical	1.846 (0.754)
8. Machinery	1.700 (0.735)
9. Electronic	-0.773 (0.881)
Model information	
F-value	0.956
R^2	0.060
Adjusted R square	-0.003
N	146
Explanation:	$^*p < 0.05;$ $^{**}p < 0.01$

4.5.3 Regression analysis production costs

The second regression analysis is focused on the production costs. The outcomes are shown in table 10. With an F-score of 1.678 and a significance of 0.098, the model is not considered to be significant, but it is not far off. The adjusted R square has a score of 0.034, which shows that 3,4% of the variance can be explained by the independent variables. The remaining variance can be explained by other independent variables. Social innovations applied show a significant negative relationship with production costs (B = -0.102, sig. = 0.002). This significant value has come forward after controlling for technological innovations, firm size and type of industry. An explanation could be that social innovations focus on improving efficiency, productivity or the workflow, this can lead to lower costs. Appendix I shows a more detailed look at all the outcomes of this first regression analysis. Concluding, the production costs will decrease with more social innovations being applied.

The technological innovations do surprisingly have a non-significant positive relationship with the production costs (B = 0.030, sig. = 0.467). This displays that technological innovations do not

decrease production costs. As the B-value is just above zero, it might just have been a snapshot of 2014. An overarching explanation could be that technological innovations might not have a cost focus. Perhaps the focus of these innovations is more on other areas. In the theoretical framework, the study of Chen and Tebourbi (2020) did also mention that a firm might face inefficiencies because of too little resources and capital to switch to a new policy. Another explanation might be a firm's reliance on 'bad' resources, so even technological innovations do not improve production costs (Su et al., 2020). The firm size has a small non-significant positive influence (B = 0.183, sig. 0.539). Larger firms do have more production costs according to this outcome. This can be related to technological innovations having a positive relationship, as larger firms are likely to have more innovations implemented. The type of industry shows a lot less difference than at the revenue growth. Most of the industry types have a non-significant negative relationship with the production costs.

With the results of the second regression analysis, hypothesis 2 will be supported. Social innovations applied by a firm do have a significant decreasing effect on the production costs of a firm.

Table 10: Regression analysis production costs

	Production costs
	B (SE)
Independent variable	
1. Social innovations applied	-0.102 (0.002)**
Control variables	
2. Technological innovations applied	0.030 (0.467)
3. Number of employees	0.183 (0.539)
4. Food	0.017 (0.964)
5. Textile	-0.229 (0.512)
6. Construction	0.049 (0.904)
7. Chemical	-0.337 (0.336)
8. Machinery	-0.111 (0.719)
9. Electronic	-0.061 (0.841)
Model information	
F-value	1.678
R^2	0.083
Adjusted R square	0.034
N	177
Explanation:	[*] $p < 0.05$; [**] $p < 0.01$

4.6   Summary quantitative results

In summary, one of the hypotheses is rejected and the other one is supported. The analysis showed that social innovations do not significantly influence revenue growth. A positive relationship was expected but a negative relationship was present. Social innovations do however influence production costs significantly. The production costs decrease with the implementation of social innovations. Furthermore, firm size showed to have a positive relationship with both revenue growth and production costs. The larger the firm, the more revenue growth but also more production costs, but this is an insignificant relationship here. The type of industry had a more wide-spread influence, especially on revenue growth. Some explanations of these outcomes are given already. In the final section of this thesis, an interpretation of both the quantitative and the qualitative results will be discussed.

5. Qualitative results

In this section the coded interviews will be described. The EMS showed some difficulties in relating certain innovation items to the categories of Volberda et al. (2013). The choice has however been made for the interviews to have a focus on these categories with the use of the EMS-items, so there is a coherence with the quantitative results. All the other key concepts are also present in the interview questions (Appendix K). Using an answer from a transcript and stating it as a social innovation showed some difficulties as the EMS-items were focused on organizational practices, but useful information can still be conducted. All the interviews will be described separately first, at the end they will be used together to test the hypotheses. A brief summary will conclude this section.

5.1 Interview machinery firm

In the first interview (Appendix M) a respondent from a machinery firm participated. With a number of 300 employees at this firm location, it can be seen as a large firm. During this interview, some interesting things came up. As a firm they primarily focus on technological innovations. Social innovations were not a priority on its own in most cases, but they were part of the technological innovations. This can be explained as a simultaneous use of both types of innovation.

In the interview questions, 13 of the EMS-items (from question 3, Appendix A) are tested for. In this interview it became clear that 9 of these are clearly visible at this firm. As these EMS-items are labelled as 'organizational practices', it does show difficulties to relate all of them to a social innovation category. The present EMS-items are shown at the end of the transcript (Appendix M). With a number of 9 items applied, it does show correlation with the quantitative analysis, as 8 was the mean of social innovations applied. As fewer items were tested here than in the EMS, a score of 9 can be seen as very high.

When looking at the social innovations, most of the implemented innovations were focused on efficiency and the workflow. The workflow was regularly analyzed and therefore certain aspects could be improved. The respondent mentioned that they were not the type of firm that just goes about and changes their workflow often. Most of their innovations are smaller ones and they came up because of technological innovations. Their focus on efficiency can be related to social innovations from the 'working smarter' category. The respondent mentioned outside pressure on the quality standards of the machines they produced. With a focus on reaching these quality standards, technological innovations were conducted. With these innovations, some changes in the workflow came up, this can be seen as a social innovation. An example is that because of more explicit co-creation between departments, the lead time was decreased. Working from home is also implemented more because of the Covid-19 pandemic, this did change the workflow of the firm a bit as well. More co-creation between departments and working from home can both be seen as social innovations.

Another observation is that there is a lot of focus on social innovations from the 'dynamic management' category. This is shown in the fact that a lot of training and courses are available for the employees. With these training days the employees get familiar with new developments in their sector and the effects this has on the firm. This gives the opportunity to ask questions and give feedback to their supervisors. With the training and courses the firm tries to pass knowledge on between the employees, to make sure it is captured by multiple people.

Looking at the financial results of this firm, it showed decent numbers. The revenue of the firm stayed about the same last year. Furthermore, there has been a decrease in production costs. This is however stated as just a small decrease over the last two years. The respondent did mention that innovations were the cause of this decrease, but mainly the technological ones. Overall, this interview showed that social innovations are part of the innovations at this firm. The annual numbers of this firm are hard to relate to the implementation of social innovations. Therefore, this interview showed no clear significant relationship between social innovations with either revenue growth or production costs. There was however a non-significant negative relationship between innovations and production costs.

5.2   Interview electronic firm

The second interview (Appendix N) was conducted with a respondent from a large electronic manufacturing firm. With around 1500 employees, it can definitely be seen as a large firm. This interview showed a lot of similarities to the first interview. At this firm, the focus was also on technological innovations. The social innovations present came up because of the technological innovations. So, both types of innovations were present here. As this firm is known to be very innovative, the total number of innovations is high here.

In the interview questions, 13 of the EMS-items (question 3, Appendix A) are tested for. Within this interview, 10 of these items are fully or partly present. Once again, it should be mentioned that in the EMS these are called 'organizational practices', which are closely related to social innovations. The present EMS-items are shown at the end of the transcript (Appendix N). This number is higher than the mean of 8 from the quantitative analysis. In those results it was also shown that larger firms are more likely to have more social innovations applied.

As this firm has many employees and a lot of specialist products, a lot of their work has been standardized. While working on a project basis, every project has a form of standardization present. In general, this firm implements a lot of technological innovations. When looking at the individual projects, social innovations are applied. Most of these social innovations are visible in the workflow or in the co-creation. These social innovations do come up because of the implementation of technological innovations.

Most of the social innovations here can be related to the 'working smarter' or 'co-creation' categories. The respondent mentioned that working smarter is an independent goal of the firm. Being effective as well as efficient in their workflow can improve total efficiency. An example here was that a new internal program was installed to run models via computers. Via this technological innovation, the employees were expected to reduce their time on the computer and stay more in touch with other departments. It has thus led to social innovations in the workflow as well. At this firm there is a lot of focus on co-creation anyway. As the projects take months to complete, a lot of intermediate steps are taken whereby communication is key.

Looking at the financial results of this firm, there is a steadiness visible. The revenue of the firm stayed around the same, as there were problems with resources for electronic firms because of the pandemic. The production costs also stayed around the same for the last year, a really small decrease is shown. These results show that innovations in general do not immediately have to influence either revenue growth or production costs. As social innovations are just a small priority of this firm there is no relationship found between social innovations with either revenue growth or production costs.

5.3   Interview construction firm

In the third interview (Appendix O) a construction firm respondent participated. With around 60 employees this is a much smaller firm than the ones in the first two interviews. The size of the firm did show some differences as this firm was less innovative than the two firms before. Both types of innovations were present here, but there was a little more focus on the social innovations here.

In the interview questions, 13 of the EMS-items (question 3, Appendix A) are tested for. At this construction firm, 6 of these items are clearly present. The present EMS-items are shown at the end of the transcript (Appendix O). This number is below the mean of 8 from the quantitative analysis. This does relate with the idea that smaller firms are less likely to have a lot of social innovations applied. Despite social innovations being more of a priority here, the number of innovations applied is lower.

The respondent mentioned that there is a ´project culture´ at this firm. By working on projects different construction demands are met. During these projects there are a lot of opportunities to innovate ´on the job´. Social innovations are implemented but their presence is not firm-wide, it is more of an 'innovate per project' type of innovating. Because of this way of innovating, social innovations do receive a decent amount of attention. For the future, their eye is more on technological innovations, but these types of innovations do cost a lot more for the firm.

When looking at the social innovations, they can be related mostly to the 'flexible organizing', 'working smarter' and 'co-creation' categories. Because of their structure, this firm is very flexible in their organizing. There is opportunity for improvement on every project and it is not really

standardized. Every project is analyzed thoroughly and this should lead to the right decisions. Furthermore, there is a focus on lead time primarily. All the individual projects have a due date, with a focus on keeping lead time small, so the firm has space to cope with setbacks. An example is taking high-quality pictures which makes sure the construction site can be reviewed better without having to be on location. This has led to an increased workflow. But most of their 'working smarter' innovations are per project and not necessarily a new firm-wide innovation. As this firm is also dependent on collaborations with external parties, their co-creation is on a high level.

The goal of this firm is to grow fast, their financial numbers do back this up. Revenue has taken a nice increase, but their profits are immediately used for new projects. The production costs have decreased at this firm. All in all, this shows this firm is steadily improving. Social innovations are more of a priority at this firm compared to the first two interviews. Despite a lower amount of social innovations applied, the relationships with revenue growth and production costs are more obvious as they are 'per project innovations'. At this firm, social innovations have an increasing effect on revenue growth and a decreasing effect on production costs. The respondent did however mention that it was hard for them to measure the exact influence of social innovations on the revenue and production costs.

5.4 Interview electronic firm 2

The fourth and final interview (Appendix P) was with a respondent from a smaller firm in the electrical industry. With a number of 60 employees this firm was significantly smaller than the other participating electronic firm. This interview showed similarities with the construction firm interview, as both were smaller firms, this does therefore not seem coincidental. At this firm there was more focus on social innovations separately as well. Technological innovations were also part of innovation, but this was deemed very costly for this firm.

In the interview questions, 13 of the EMS-items (question 3, Appendix A) are tested for. Just as in the previous interview, 6 items were clearly visible. The present EMS-items are shown at the end of the transcript (Appendix P). Once again, a smaller firm scores below the mean of 8 from the quantitative analysis. Social innovations do receive more separate attention at this firm, but still their number of innovations applied is lower.

When looking at the social innovations most of them relate to the 'working smarter' or 'co-creation' category. A main example of a social innovation implemented from the working smarter category is the fact that the layout of their workspace has been improved after comments from employees. With this innovation the efficiency was improved. As this firm is smaller, their communication is a bit easier to control. An improvement in their co-creation has been made about the state of supply stock. Instead of always calling about the number of stock, an overarching viewer is used to give employees the opportunity to continuously pass on information about the stock.

The 'dynamic management' category focuses on training for employees and passing knowledge on. At this firm very few innovations related to this category are present. When a new employee is starting, he/she is coached by experienced colleagues. But after this, very few training or courses are available for the employees. The knowledge in this firm is not really shared among all employees, it is more a shift in department knowledge per department.

In the financial results, very good numbers are shown. The revenue has increased a lot in 2020, as this firm profited from the pandemic. As this might not be a fair comparing year, earlier years showed there is also a steady growth in revenue. Their production costs are about the same, there is not really an increase or decrease over the last few years. All in all, this interview showed that revenue is growing but it is hard to show the relationship with social innovations. As social innovations are a bigger priority here despite a lower presence, it can be argued that it does have its influence. The production costs are relatively the same, so they are not significantly influenced by social innovations. So, no significant relationships have been found in this interview.

5.5   Testing hypotheses

With individually describing all the interviews an overarching view of the qualitative results can be formed. In this section the interviews will be used together to test the hypotheses of this thesis.

The first hypothesis focuses on revenue growth. The hypothesis stated: *Social innovations in a firm have an increasing effect on the growth in revenue of a firm* (H1). The first and second interview showed that the revenue stayed about the same. So, there was no increase but also no decrease. The third and fourth interview showed an increase in revenue, which also showed an increase in revenue growth. Relating the revenue growth back to social innovations was a difficult part. In all the interviews a fair amount of social innovations were applied. It showed that the bigger firms have social innovations as part of their technological innovations. At the smaller firms, social innovations were more of an independent priority, but less innovations were applied here. After examining all the qualitative results, a conclusion can be drawn. Social innovations do not directly influence revenue growth of a firm on a significant basis. With these results hypothesis number one will be rejected.

The second hypothesis focuses on production costs. The hypothesis stated: *Social innovations in a firm have a decreasing effect on the production costs of a firm* (H2). Interviews one and three showed a small decrease in production costs. Interview two and four showed that production costs stayed about the same, with a little edge towards decreasing. Relating the changes in production costs back to social innovations was easier than relating social innovations and revenue growth. Most of the social innovations applied are related to the 'working smarter' category as they were focused on efficiency or lead time. Larger firms did have more social innovations applied than the smaller firms. After examining all the results, a conclusion can be drawn. Social innovations do influence production

costs, they have a negative relationship, but no significant relationship was found here. The non-significant relationship shows that social innovations lead to a decrease in production costs, but it does not decrease them significantly. With these results hypothesis number two will not be supported.

5.6   Summary qualitative results

In summary, both hypotheses are rejected by the qualitative data. As four cases is a way smaller sample size, the interviews are hard to generalize. The interviews showed no significant relationship between social innovations and revenue growth, hypothesis one was thus rejected. Adding on, the interviews showed a non-significant negative effect of social innovations on production costs. Hypothesis two is rejected, as the relationship is negative, as expected, but not a significant one. Furthermore, it does show that larger firms have more social innovations applied. The type of industry is not taken into account here as just four cases are too few to be a determinator. As the quantitative analysis had a way bigger sample size, those outcomes carry more weight.

A possible explanation of these results can be that most of the innovations applied are focused on efficiency and decreasing lead times. As these innovations are mostly related to the 'working smarter' category, the effects are shown in the production costs first. While focusing on improving the work flow the participating firms try to decrease their production costs, the results show a negative relationship. An explanation on the non-significant relationship between social innovations and revenue growth can be that the innovations cost money and take time to earn itself back. As the interviews showed, most of the innovations are applied over time and after speaking with employees. A new work flow needs time to implement and therefore it takes time before it becomes profitable. Another remark is that the differences in firm size are significant in the interviews, this gives different results. The bigger firms have more innovations applied in numbers, but relatively speaking the smaller firms are more innovative. An explanation can be that large firms are more set in their ways and they do not have to be as innovative as their formula brought them success already. Smaller firms might be trying to grow by being more creative and innovative, thus showing relatively more innovative initiatives. Comparing this to the quantitative results shows a similar firm approach, larger firms have more innovations in numbers but relatively the smaller firms are more innovative. In the last section an interpretation of the results will be given where all the results come back.

6.   Conclusion and discussion

For the final section of this thesis a summary will be given which will answer the research question. Following up, the results displayed in both the results sections will be interpreted and compared to the theoretical framework arguments that led to the hypotheses of this thesis. With the interpretation of the results, certain recommendations can be formed for both practice and theory. Lastly, the limitations this thesis presents will be discussed.

6.1   Summary

When introducing this thesis, a beginning was made in explaining and understanding the social innovation topic. With this introduction an overarching research question was established: '*What is the influence of social innovations on the financial performance of Dutch firms in the manufacturing industry?*'. This research question was formed to reach a specific objective: 'to contribute to existing scientific knowledge and to add on new knowledge about social innovations'. This objective was concretized by looking at which social innovations are present and how they influence revenue growth and the production costs and how to explain this.

In the theoretical framework, two different hypotheses were formed after looking at literature and empirical studies. This thesis hypothesized that social innovations in a firm have an increasing effect on the growth in revenue of a firm (*H1*). Adding on to hypothesis one, this thesis hypothesized that social innovations in a firm have a decreasing effect on the production costs of a firm (*H2*). Both hypotheses are shown in the conceptual model of this thesis.

To test the hypotheses, both quantitative and qualitative analyses have been conducted. To start, the Dutch edition of the EMS of 2015 was studied, using the relevant information beneficial for this thesis. Dutch manufacturing firms were surveyed on several topics, resulting in a large database. Analysis of the quantitative data showed no support for the first hypothesis, as revenue growth was not significantly influenced by the social innovations applied. The second hypothesis was supported as social innovations did have a significantly negative influence on production costs. After analyzing this quantitative data, several semi-constructed interviews were conducted to receive qualitative data. Analysis of the qualitative data once again showed no support for the first hypothesis, as no significant increase in revenue growth was found. The second hypothesis was not supported by the qualitative results, as a non-significant decrease was shown in production costs.

Sub-question one tried to find out which social innovations were present at Dutch manufacturing firms. Both the quantitative and the qualitative results show that most of the social innovations applied are related to the 'working smarter' category, most of the time based on workflow and efficiency. Looking at sub-question two and three, this thesis tried to find out to what extent both

revenue growth and production costs are influenced by social innovations and how to explain this. In both result sections it is shown and explained that social innovations do not increase revenue growth on a significant basis. In the qualitative results, there is a non-significant decrease shown in production costs because of social innovations. Social innovations in the quantitative results led to a significant decrease in production costs.

As for the research question, this thesis shows that financial performance can be influenced by social innovations. In total, a significant decrease in production costs was found because of social innovations. Revenue growth was not significantly influenced by social innovations. All in all, this thesis showed that a fair amount of social innovations are applied by several Dutch manufacturing firms, but their influence is primarily visible in the production costs. In the long term decreasing production costs might lead to more revenue for a firm. Social innovations are certainly a large influencing factor for the financial performance of a firm.

6.2   Interpretation of the results

In the theoretical framework several empirical studies were used to come to certain hypotheses. The framework hypothesized that social innovations have an increasing effect on the growth in revenue of a firm. After conducting two types of analysis, the hypothesis was not supported by both types of data. A non-significant relationship was found in the data. As this result is different than the theoretical framework would have expected, the results should be closely analyzed. A first explanation could be that this thesis is focused on the short term. In the EMS, revenue growth was based on the percentual difference in annual turnover between 2012 and 2014. Revenue growth might be an indicator which is influenced more in the long term. From 2012 to 2014 is perhaps too short of a period to see an actual difference in revenue growth. In the interviews, there was also no significant relationship found between social innovations and revenue growth. Here, the applied social innovations were part of bigger technological innovations at the larger firms. A growth in revenue was therefore hard to relate to the social innovations. At smaller firms, the social innovations were more of a priority, but fewer innovations were applied. This could influence the revenue growth outcome. Another explanation could be that implementing social innovations might cost (a lot of) money, this might explain that in the short term it costs more than it benefits. As a new innovation is implemented it could take some time before it is really settled in with a firm as well. In the theoretical framework, the study of Su et al. (2020) did also mention high costs to adapt to an innovation dimension. The costs or time it takes to implement a social innovation is not a focal part of this thesis. It can however be an explanation as to why a non-significant relationship between social innovations and revenue growth has been found.

Besides the revenue growth, the production costs were an indicator of financial performance in this thesis. The theoretical framework hypothesized that social innovations have a decreasing effect on the production costs of a firm. After conducting two types of analysis, the hypothesis was supported by the quantitative but not by the qualitative data. A significant negative relationship was found in the EMS-data and a non-significant negative relationship was found in the interviews. As the sample size was much larger in the quantitative data, the overarching answer of this thesis is that there is a significant negative relationship. This result is the same as the theoretical framework would have expected. A first explanation could be that a lot of social innovations applied are related to the 'working smarter' category, which focuses on efficiency. As social innovations can have a direct effect on efficiency, the production costs can be decreased immediately after implementing. Another explanation could be that social innovations are often trying to improve workflow and co-creation, the interviews showed this a lot. Improving the workflow and improving working together can often be an opportunity to cut costs and thus influence the production costs. This argument is closely related to the first argument. The arguments mentioned could be an explanation as to why a significant negative relationship between social innovations and production costs has been found.

The most surprising outcome in the results not related to social innovations was that technological innovations did have a non-significant positive influence on production costs. Chen and Tebourbi (2020) explained before that a firm might face inefficiencies because of too little resources and capital to switch to a new policy. Another explanation given might be that a firm relies on 'bad' resources, so even technological innovations do not improve production costs as the resources can still be in use (Su et al., 2020). These are arguments which could explain as to why this relationship has been found.

6.3 Recommendations

With the use of the results, this thesis can form some recommendations. Looking at social innovations in practice, it showed that a lot of firms have already applied some innovations. This thesis showed that applying social innovations leads to a significant decrease in production costs. As the manufacturing industry is mostly known for technological innovation, social innovations should be more of a priority for firms. In the long term this might influence revenue growth as well, as costs are decreasing. Another recommendation would be to regularly analyze the workflow and to keep on improving with the use of social innovations. Do not settle as a firm after implementing a single social innovation, regularly analyzing will show if it leads to good results. During an analysis, multiple things to improve can come up as there is always opportunity to innovate. Lastly, firms should keep in mind that social innovations might cost them money early on, as the innovation itself costs money or it takes time for the innovation to fully settle into a firm. Having a detailed calculation before implementing should be considered. All in all, manufacturing firms should definitely have more attention for social innovations.

For future research, some recommendations can also be formed. It would be very valuable to research the short and long term effects of social innovation implementation. As this thesis has a focus on the short term, the long term remains unknown territory. More research in this area would lead to more specific knowledge on the social innovation topic. Another recommendation would be to have a clear and more all-encompassing categorization of types of social innovation. Multiple terms are used now to describe roughly the same type of innovations. With a clearer framework here, the social innovations can be studied more precisely. Lastly, this thesis did not find a significant relationship between social innovations and revenue growth. It would be recommended to do additional research in this area and really focus on what type of social innovations do influence revenue and why.

6.4   Limitations

As this thesis comes to an end, it can be analyzed as well. During this process, some difficulties came up which has led to certain limitations. First of all, it is quite hard to generalize the results of this thesis. The amount of interviews is low and different kinds of firms were interviewed. This leads to difficulties to generalize the qualitative results. Looking at the EMS-database, a significantly larger sample size is used. Still, the explanatory ability of the items explaining revenue growth for example was low, as the coefficient of determination was a number below zero. A bigger sample size would have been valuable for the quantitative results.

As doing the actual research comes after the establishment of the theoretical framework, there should be a coherence between them. In the theoretical framework a categorization of social innovations was used to determine types of social innovation. While working with the EMS it showed difficulties to relate the EMS-items to a specific social innovation category, as the EMS-items were labelled as 'organizational practices'. This also showed in the interviews, as determining in which category a certain innovation would be used showed some difficulties. Overall, this showed that sometimes social innovations were far stretched but the focus was more on organizational practices, which are closely related though. The EMS might not have been the most specific database for a deeper focus on social innovations, so this should be taken into account.

A last issue for this thesis came from the operationalization. The revenue growth is determined with a percentual difference between 2012 and 2014. As production costs were determined by just looking at 2014, a different determination was used. Adding on, the production costs were calculated with answer categories. As this is a different calculation, the comparability of revenue growth with production costs might be influenced. Using the same type of output for the dependent variables might have improved this thesis.

7. References

- Ahmad, M., & Khattak, S. I., & Khan, S., & Rahman, Z. U. (2020). Do aggregate domestic consumption spending & technological innovation affect industrialization in South Africa? An application of linear & non-linear ARDL models. *Journal of Applied Economics, 23*(1). 44-65. https://doi.org/10.1080/15140326.2019.1683368

- Alonso-Martínez, D., & González-Álvarez, N., & Nieto, M. (2019). The influence of financial performance on corporate social innovation. *Corporate Social Responsibility & Environmental Management, 26*(4). 859-871. https://doi.org/10.1002/csr.1726

- Alshehhi, A., Nobanee, H., & Khare, N. (2018). The Impact of Sustainability Practices on Corporate Financial Performance: Literature Trends and Future Research Potential. *Sustainability*, *10*(2), 494. https://doi.org/10.3390/su10020494

- Andersen, M. M. (2010). On the faces and phases of eco-innovation - On the dynamics of the greening of the economy. *Druid Summer Conference 2010*, 1-23. Retrieved from: https://www.researchgate.net/publication/228821821_On_the_Faces_and_Phases_of_Eco-innovation-On_the_Dynamics_of_the_Greening_of_the_Economy

- Azar, G., & Ciabuschi, F. (2017). Organizational innovation, technological innovation, and export performance: The effects of innovation radicalness and extensiveness. *International Business Review, 26*(2). 324-336. https://doi.org/10.1016/j.ibusrev.2016.09.002

- Bacinello, E., & Tontini, G., & Alberton, A. (2019). Influence of maturity on corporate social responsibility and sustainable innovation in business performance. *Corporate Social Responsibility & Environmental Management, 27*(2). 749-759. https://doi.org/10.1002/csr.1841

- Begonja, M., & Čićek, F., & Balboni, B., & Gerbin, A. (2016). Innovation and business performance determinants of SMEs in the Adriatic region that introduced social innovation. *Economic Research, 29*(1). 1136-1149. https://doi.org/10.1080/1331677X.2016.1213651

- Bleijenbergh, I. (2015). *Kwalitatief onderzoek in organisaties* (2e ed.). The Hague, The Netherlands: Boom Lemma uitgevers. ISBN 978-90-6236-463-9

- Boeije, H. (2014). *Analyseren in kwalitatief onderzoek* (2nd ed.). The Hague, The Netherlands: Boom Uitgevers. Retrieved from: http://radboud.bibliotheek.budh.nl.ru.idm.oclc.org/boek/9789462363977/

- Borenich, A., & Greistorfer, P., & Reimann, M. (2019). Model-based production cost estimation to support bid processes: an automotive case study. *Central European Journal of Operations Research, 28*(3), 841-868. https://doi.org/10.1007/s10100-019-00608-1

- Business Literacy Institute. (2021). Revenue Growth. Retrieved from: https://www.business-literacy.com/financial-concepts/revenue-growth/

- Cavazos-arroyo, J. (2020). An Exploration of Some Effects of Social Innovation Capability in Social Enterprises in Mexico. *Journal of Technology Management & Innovation, 15*(4). 63-69. https://doi.org/10.4067/s0718-27242020000400063

- Chen, F-C., & Tebourbi, I. (2020). The relationship between business performance, corporate social responsibility, and innovation capital: A case study of Taiwan. *Management & Decision Economics, 42*(2). 360-368. https://doi.org/10.1002/mde.3240

- Cochran, P. L., & Wood, R. A. (1984). Corporate Social Responsibility and Financial Performance. *Academy of Management Journal, 27*(1), 42-56. https://doi.org/10.5465/255956

- Corporate Finance Institute. (2015). What is Cost of Production? Retrieved from: https://corporatefinanceinstitute.com/resources/knowledge/finance/cost-of-production/

- Delen, D., & Kuzey, C., & Uyar, A. (2013). Measuring firm performance using financial ratios: A decision tree approach. *Expert Systems with Applications, 40*(10), 3970-3983. https://doi.org/10.1016/j.eswa.2013.01.012

- Del Mar Miras-Rodríguez, M., & Bravo-Urquiza, F., & Escobar-Pérez, B. (2020). Does corporate social responsibility reporting actually destroy firm reputation? *Corporate Social Responsibility and Environmental Management*, *27*(4), 1947-1957. https://doi.org/10.1002/csr.1938

- Freeman, R. E., & Harrison, J. S., & Wicks, A. C., & Parmar, B., & De Colle, S. (2010). *Stakeholder Theory - The State of the Art* (1st ed.). New York, United States of America: Cambridge University Press. Retrieved from: http://93.174.95.29/main/7C6D90BA69B8A2AD03EFDCB621D5A083

- Gasparin, M., & Green, W., & Lilley, S., & Quinn, M., & Saren, M., & Schinckus, C. (2021). Business as unusual: A business model for social innovation. *Journal of Business Research, 125*. 698-709. https://doi.org/10.1016/j.jbusres.2020.01.034

- Gunday, G., & Ulusoy, G., & Kilic, K., & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics, 133*(2). 662-676. https://doi.org/10.1016/j.ijpe.2011.05.014

- Hair, J. F., Black, W. C., Babin, B. J. & Anderson, R. E. (2014). *Multivariate Data Analysis* (7th ed.). Edinburg, Great Britain: Pearson.

- Heerwagen, J. (2010). Green buildings, organizational success and occupant productivity. *Building Research & Information, 28*(5/6), 353-367. https://doi.org/10.1080/096132100418500

- Hiteva, R., & Sovacool, B. (2017). Harnessing social innovation for energy justice: A business model perspective. *Energy Policy, 107*. 631-639. https://doi.org/10.1016/j.enpol.2017.03.056

- Hochgerner, J. (2011). The Analysis of Social Innovations as Social Practices. *Transatlantic Science and Technology Quarterly, 30*(1), 1-15. Retrieved from:

https://www.academia.edu/18385585/The_Analysis_of_Social_Innovations_as_Social_Practice

- Ingarao, G. (2017). Manufacturing strategies for efficiency in energy and resources use: The role of metal shaping processes. *Journal of Cleaner Production*, *142*(4), 2872–2886. https://doi.org/10.1016/j.jclepro.2016.10.182

- Jamali, D., & Karam, C. (2018). Corporate Social Responsibility in Developing Countries as an Emerging Field of Study. *International Journal of Management Reviews, 20*(1), 32-61. https://doi.org/10.1111/ijmr.12112

- Juščius, V., & Snieška, V. (2008). Influence of Corporate Social Responsibility on Competitive Abilities of Corporations. *Engineering Economics, 58*(3). 34-44. Retrieved from: https://www.inzeko.ktu.lt/index.php/EE/article/view/11548

- Lawrence, A. T., & Weber, J. (2016). *Business and Society - Stakeholders, Ethics, Public Policy* (15th ed.). New York, United States of America: McGraw-Hill Education. Retrieved from: http://93.174.95.29/main/C2103344A345AF9BA0879122551A26BE

- Macmillan, C. (2020). Sustainable Business Model Innovation: A Means to Societal and Economic Good for Canadian Businesses. *International Management Review, 16*(1). 32-41. Retrieved from: http://web.a.ebscohost.com.ru.idm.oclc.org/ehost/detail/detail?vid=3&sid=03fac0c6-7bea-4f79-a4a2-d7eded44b6f1%40sdc-v-sessmgr01&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=142549918&db=bth

- McNamara, C. (2005). *Field Guide to Consulting and Organizational Development: A Collaborative and Systems Approach to Performance, Change and Learning* (1st ed.). Minneapolis, United States of America: Authenticity Consulting LLC. Retrieved from: https://www.authenticityconsulting.com/misc/PR_CODNP-IPPY.pdf

- Herciu, M., & Şerban, R. A. (2018). Measuring Firm Performance: Testing a Proposed Model. *Studies in Business & Economics, 13*(2). 103-114. https://doi.org/10.2478/sbe-2018-0023

- McClave, J. T., & Bensen, P. B., & Sincich, T., & Knypstra, S. (2011). *Statistiek – Een inleiding* (11th ed.). Amsterdam, The Netherlands: Pearson Benelux BV. ISBN 978-90-430-1965-1

- Mihci, H. (2020). Is measuring social innovation a mission impossible? *Innovation: The European Journal of Social Science Research, 33*(3). 337-367. https://doi.org/10.1080/13511610.2019.1705149

- Mumford, M. D. (2002). Social Innovation: Ten Cases From Benjamin Franklin. *Creativity Research Journal, 14*(2). 253-266. https://doi.org/10.1207/S15326934CRJ1402_11

- Neely, A. (2002). *Business Performance Measurement - Theory and Practice* (1st ed.). Cambridge, United Kingdom: Cambridge University Press. Retrieved from:

http://content.schweitzer-online.de/static/catalog_manager/live/media_files/representation/zd_std_orig__zd_schw_orig/002/183/245/9780521803427_table_of_content_pdf_1.pdf

- Orlitzky, M. (2011). Institutional Logics in the Study of Organizations: The Social Construction of the Relationship between Corporate Social and Financial Performance. *Business Ethics Quarterly, 21*(3). 409-444. https://doi.org/10.5840/beq201121325

- Phillips, R. (2003). *Stakeholder Theory and Organizational Ethics* (1st ed.). San Francisco, United States of America: Berett-Koehler Publishers Inc. Retrieved from: https://www.researchgate.net/publication/247637175_Stakeholder_Theory_and_Organizational_Ethics

- Pot, F. (2011). Workplace innovation for better jobs and performance. *International Journal of Productivity and Performance Management, 60*(4), 404-415. https://doi.org/10.1108/17410401111123562

- Su, R., Liu, C., & Teng, W. (2020). THE HETEROGENEOUS EFFECTS OF CSR DIMENSIONS ON FINANCIAL PERFORMANCE – A NEW APPROACH FOR CSR MEASUREMENT. *Journal of Business Economics and Management*, *21*(4), 987–1009. https://doi.org/10.3846/jbem.2020.12394

- The Institute of Internal Auditors. (2010). Corporate Social Responsibility. Retrieved from: https://na.theiia.org/OntolicaSearch/Pages/DefaultResults.aspx?k=csr%20&s=NA%20Sites&start1=0&ct=Site&cs=The%20Institute%20of%20Internal%20Auditors%20North%20America&ref=https://na.theiia.org&ret=https%3A%2F%2Fna.theiia.org%2FPages%2FIIAHome.aspx

- Van der Have, R. P., & Rubalcaba, L. (2016). Social innovation research: An emerging area of innovation studies? *Research Policy, 45*(9). 1923-1935. https://doi.org/10.1016/j.respol.2016.06.010

- Van der Walle, E., & Tamminga, M. (2021, 12 februari). Beleggers duwen Shell stapje voor stapje richting verduurzaming. [NRC Handelsblad]. Retrieved from: https://www.nrc.nl/nieuws/2021/02/12/beleggers-duwen-shell-stapje-voor-stapje-richting-verduurzaming-a4031635#:~:text=vragen%20Wachtwoord%20vergeten-,Beleggers%20duwen%20Shell%20stapje%20voor%20stapje%20richting%20verduurzaming,druk%20van%20de%20financi%C3%ABle%20wereld

- Vennix, J. A. M. (2016). *Onderzoeks- en interventiemethodologie* (6th ed.). Nijmegen, The Netherlands: Pearson Benelux BV. ISBN 978-9-0430-3518-7

- Volberda, H. W., Commandeur, H. R., Van den Bosch, F. A. J., & Heij, C. V. (2013). Sociale Innovatie als aanjager van productiviteit en concurrentiekracht. *M & O : Journal for Management and Organisation*, *5*, 5-34. Retrieved from: https://docplayer.nl/7058697-Sociale-innovatie-als-aanjager-van-productiviteit-en-concurrentiekracht.html

- Wood, D. J. (2010). Measuring Corporate Social Performance: A Review. *International Journal of Management Reviews, 12*(1), 50-84. https://doi.org/10.1111/j.1468-2370.2009.00274.x
- Zulkiffi, S. N. A., & Perera, N. (2011). A literature analysis on business performance for SMES - subjective or objective measures? *Society of Interdisciplinary Business Research,* 1-9. https://doi.org/10.2139/ssrn.1867874

8.   Appendices

Appendix A: EMS survey 2015 (in Dutch)

3 **Welke van de volgende organisatieconcepten en werkwijzen worden momenteel in uw bedrijfsvestiging toegepast?**

Toepassing gepland voor 2018	Nee	Organisatieconcepten	Ja	Voor het eerst toegepast[1]	Omvang van het toegepaste potentieel[2]		
		Organisatie van het werk					
☐	←☐	Gedetailleerde voorschriften voor de werkplekinrichting van apparatuur en opslag van tussenproducten (bijv. 5-S methode)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Gestandaardiseerde en gedetailleerde werkinstructies	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Taakverrijking productiemedewerker (integratie van planning, uitvoering of controle)	☐→	19/20 ☐	☐	☐	☐
		Organisatie van de productie					
☐	←☐	Maatregelen ter verbetering van de interne logistiek (Value Stream Mapping/Design, ruimtelijke inrichting van productiestappen)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Klant- of productgeoriënteerde inrichting van productie-eenheden (i.t.t. functionele indeling)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Vraaggestuurde productie (bijv. KANBAN, afschaffen van tussenvoorraden)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Voorgeschreven methoden voor het verkorten van omstel- en aanlooptijden bij productwisseling (bijv. Single Minute Exchange of Die; Quick Change Over)	☐→	19/20 ☐	☐	☐	☐
		Productiemanagement/ -beheersing					
☐	←☐	Grafische weergave werkprocessen en -status (Visual Management; dashboard)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Kwaliteitsmanagement (bijv. preventieve onderhoud, total quality management/TQM, total productie-onderhoud/TPM)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Methoden voor operation management o.b.v. wiskundige analyse van productie (bijv. Six Sigma methode)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Methoden van continu verbeteren (Kaizen, kwaliteitscirkels e.d.)	☐→	19/20 ☐	☐	☐	☐
		Energie- en milieubeheersing					
☐	←☐	Gecertificeerd energie-management systeem volgens ISO 50001, voorheen: EN 16001	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Instrumenten voor productlevenscyclus-analyse (bijv. EU Ecolabel, Cradle-to-Cradle certificaat, ISO-14020)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Het opnemen van sociale en duurzaamheidseffecten in het vaststellen van bedrijfsprestaties	☐→	19/20 ☐	☐	☐	☐
		Human resource management					
☐	←☐	Maatregelen voor het behoud van oudere werknemers of hun kennis voor uw bedrijfsvestiging (bijv. teams met verschillende leeftijdsgroepen, begeleidingsprogramma's, senior-junior tandems)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Instrumenten ter bevordering van werknemersbetrokkenheid (bijv. gratis kantine, ondersteuning kinderopvang, gezinsvriendelijke werktijden)	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Gestandaardiseerde methoden van functie-ontwerp ter verbetering van gezondheids- en veiligheidsomstandigheden op het werk (bijv. Methods-time measurement (MTM))	☐→	19/20 ☐	☐	☐	☐
☐	←☐	Financiële participatie toegankelijk voor alle werknemersgroepen (bijv. winstdelingsregelingen, aandelen(optie)plannen, enz.)	☐→	19/20 ☐	☐	☐	☐

Toelichting:
1 Het jaar waarin deze technologie voor het eerst werd toegepast in uw bedrijfsvestiging (maak een schatting indien u onzeker bent over het exacte jaar)
2 Daadwerkelijke toepassing ten opzichte van maximaal zinvolle toepassingsmogelijkheden: omvang van het gebruikte potentieel is "gering" bij eerste aanzetten, "midden" bij gedeeltelijke toepassing en "hoog" bij omvangrijke toepassing

4.1 **Welke van de volgende activiteiten worden uitgevoerd voor uw productiepersoneel in uw bedrijfsvestiging?**

Aanwezige competenties van productiewerknemers worden systematisch vastgelegd? ☐ nee ☐ ja

Functiebeschrijvingen zijn ontwikkeld voor specifieke functiegebieden in de productie? ☐ nee ☐ ja

Er bestaan specifieke competentieprogramma's for bepaalde functies ☐ nee ☐ ja

4.2 **Bij welke personeelsgroepen worden deze instrumenten gebruikt?**

☐ LBO of ongeschoold personeel ☐ MBO geschoold personeel ☐ Hooggeschoold personeel (HBO+WO)

4.3 **Bestaat er afzonderlijk beleid voor competentie-ontwikkeling en training van productiepersoneel?**

☐ nee ☐ ja → Is er in uw bedrijf voor dit beleid een vast jaarlijks budget beschikbaar? ☐ nee ☐ ja

5.1 Is er een vastgesteld aantal dagen per jaar voor verdere kwalificatie, training en ontwikkeling van het productiepersoneel?

☐ nee ☐ ja → Hoeveel dagen per jaar is er per persoon vastgesteld? ca. [ ] dagen per jaar

---

5.2 Zijn de volgende activiteiten voor verdere kwalificatie, training en ontwikkeling toegepast voor het productiepersoneel in uw bedrijfsvestiging?

In aanmerking komen de volgende groepen van productiepersoneel:

	nee	ja	LBO of ongeschoold	MBO technisch geschoold	Hooggeschoold (WO+HBO)
Training voor specifieke vaardigheden (bijv. machine-onderhoud)	☐	☐→	☐	☐	☐
Training met interdisciplinair oogmerk (bijv. taalcursussen, leiderschapstraining)	☐	☐→	☐	☐	☐
Digitale zelfscholingprogramma's (e-learning)	☐	☐→	☐	☐	☐
On-the-job training (bijv. taakrotatie, werkplekinstructie, georganiseerde ervaringsuitwisseling met collega's)	☐	☐→	☐	☐	☐
Informatie-aanbod (bijv. bedrijfstak specifieke beurzen, externe databases)	☐	☐→	☐	☐	☐
Deelname aan activiteiten voor continue kwaliteitsverbetering (bijv. kwaliteitscirkels, Kaizen)	☐	☐→	☐	☐	☐

6.1 Werkt uw bedrijfsvestiging samen met andere bedrijven op de volgende terreinen? (samenwerking = vrijwillige samenwerking die verder gaat dan eenmalige transacties tussen bedrijven)

Locatie van de partners

	nee	ja	regionaal (< 50km)	nationaal (> 50km)	buiten-land
Samenwerking in inkoop	☐	☐→	☐	☐	☐
Samenwerking in de productie (voor gezamenlijke systeemleveringen of capaciteitsuitbreiding)	☐	☐→	☐	☐	☐
Samenwerking in distributie/verkoop	☐	☐→	☐	☐	☐
Samenwerking in service	☐	☐→	☐	☐	☐
Samenwerking in onderzoek en ontwikkeling met afnemers of leveranciers	☐	☐→	☐	☐	☐
Samenwerking in onderzoek & ontwikkeling (O&O) met onderzoeksinstituten (bijv. universiteiten, TNO)	☐	☐→	☐	☐	☐

6.2 Indien uw bedrijfsvestiging voor onderzoek en ontwikkeling samenwerkt met andere bedrijven, zijn daarbij bedrijven actief op het gebied van nanotechnologie, micro-elektronica, photonen, nieuwe materialen, of biotechnologie?

☐ nee ☐ ja → ☐ nanotechnologie ☐ micro-elektronica ☐ photonen ☐ nieuwe materialen ☐ biotechnologie

---

7.1 Welke van de volgende maatregelen zijn genomen om het risico van industriële spionage te vermijden in uw bedrijfsvestiging? Sinds wanneer zijn deze ingevoerd?

	nee	ja	sinds wanneer?
Speciale IT-veiligheidsmaatregelen (bijv. geen gebruik cloud computing, versleutelen van documenten, algemeen verbod op gebruik van draagbare data media)	☐	☐→	19/20 [ ]
Werknemerstrainingen en verhoging van waakzaamheid voor het gevaar van industriële spionage	☐	☐→	19/20 [ ]
Veiligheidsmaatregelen voor toegang tot terrein, gebouwen of kamers	☐	☐→	19/20 [ ]
Veiligheidsinstructies over illegale verspreiding van informatie (bijv. regelingen voor omgaan met gevoelige gegevens in relatie tot derde partijen)	☐	☐→	19/20 [ ]

7.2 Heeft uw bedrijfsvestiging te maken gehad met spionage door andere bedrijven, buitenlandse overheidsorganisaties of met verdachte gevallen in de laatste vijf jaar?

concre(e)t(e) geval(len) ☐ nee ☐ ja → ☐ ander bedrijf ☐ buitenlandse overheidsorganisatie ☐ onbekend

verdacht(e) geval(len) ☐ nee ☐ ja → ☐ ander bedrijf ☐ buitenlandse overheidsorganisatie ☐ onbekend

---

7.3 Indien er sprake was van een verdacht of concreet geval, welke informatie was het doelwit van industriële spionage?

Informatie over....

☐ Producten (bijv. ideeën, studies, ontwikkeling, ontwerp) ☐ Productie- of fabricageprocessen ☐ Klanten/toeleveranciers (bijv. contracten, prijzen) ☐ Bedrijfsstrategie (bijv. investeringsplannen)

8.1 Welke van de volgende technologieën worden momenteel in uw bedrijfsvestiging toegepast?

Toepassing gepland voor 2018	Nee	Technologieën	Ja	Voor het eerst gebruikt (Jaar)[1]	upgrade sinds 2012 Ja	upgrade sinds 2012 Nee	Omvang van het toegepaste potentieel[2]
		Automatisering en robotisering					
☐	←☐	Industriële robots voor bewerking en fabricage (bijv. lassen, coaten, snijden)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Industriële robots voor hanteren van gereedschap en werkstukken in productie (bijv. verplaatsen, assemblage, sorteren, verpakken)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
		Energie- en grondstoffenbesparing					
☐	←☐	Controlesystemen die machines stilleggen bij onderbenutting (bijv. PROFI-energy)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Geautomatiseerde beheerssystemen voor energie efficiënte productie	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Systemen t.b.v. terugwinning van kinetische en procesenergie (bijv. terugwinnen afvalwarmte)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Technologieën voor energie- en/of warmteopwekking door middel van zon-, wind-, waterkracht, biomassa of geothermische energie	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
		Bewerkingstechnologieën voor nieuwe materialen					
☐	←☐	Productietechnologieën voor micromechanische componenten (micromachinale bewerking, lithografie, micro-injectie e.d.)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Nanotechnologische productieprocessen (bijv. oppervlaktebewerking)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Technieken voor verwerking van composietmaterialen (bijv. carbonvezel, glasvezel)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Bio- en gentechnologie in fabricageprocessen (bijv. catalysatoren, bioreactoren)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Technieken voor verwerking van legeringen (aluminium-, magnesium-, titaniumlegeringen, enz.)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
		Additieve productietechnologieën					
☐	←☐	Additive productietechnologie voor maken van prototypes (bijv. 3D printing, rapid prototyping; Selective Laser Sintering; Stereolithografie, Laser Beam Melting)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Productie met additieve productietechnologie (incl. enkelstuksproductie; kleine productieseries; reserveonderdelen)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Systemen voor Machine2Machine communicatie, Multi-agent systemen	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Systemen voor Cyber-Physical systems, cloud-computing	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
		Digitale fabriek / IT netwerken					
☐	←☐	Digitale productieplanning en roostering (bijv. ERP-systeem)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Bijna real-time productiebeheersingssystemen (bijv. systemen voor gecentraliseerde aansturing en machinegegevensverwerking	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Digitale uitwisseling van productieplanningsgegevens met toeleveranciers en/of klanten (supply chain management)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Systemen voor geautomatiseerd management van interne logistiek en orderverzameling (e.g. RFID, warehouse management system)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Mobiele/draadloze apparaten voor programmering en bediening van installaties en machines (e.g. tablets)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Product Lifecycle Management (PLM) systemen of Product/Productieproces datamanagement	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Technologieën voor veilige mens-machine interactie (bijv. coöperatieve robots, open werkstations e.d.)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐
☐	←☐	Digitale oplossingen voor het direct beschikbaar maken van tekeningen, werkschemas en -instructies op de werkvloer (e.g. tablets, smartphones)	☐→	19/20 ☐	☐	☐	☐ ☐ ☐

Toelichting:

1 Het jaar waarin deze technologie voor het eerst werd toegepast in uw bedrijfsvestiging (maak een schatting indien u onzeker bent over het exacte jaar)

2 Daadwerkelijke toepassing ten opzichte van maximaal zinvolle toepassingsmogelijkheden: omvang van het gebruikte potentieel is "gering" bij eerste aanzetten, "midden" bij gedeeltelijke toepassing en "hoog" bij omvangrijke toepassing

8.2 Welke van de volgende maatregelen nam uw bedrijfsvestiging om energieverbruik te verminderen?

	Toepassing gepland voor 2018	nee	ja
Afschakelsystemen voor onderdelen, machines of installaties indien niet in gebruik (bijv. afschakeling luchttoevoer, aangepaste verlichtingssensoren)	☐	← ☐	☐
Verbeteren van bestaande machines of installaties (bijv. hoogefficiënte motoren (IE3), aanbrengen isolatie, warmtewisselaar)	☐	← ☐	☐
Voortijdige vervanging van bestaande machines of installaties door nieuwe machines of installaties	☐	← ☐	☐

8.3 Welke van de volgende redenen en welke van de genoemde barrières zijn van doorslaggevende betekenis voor het wel of niet invoeren van energie en warmte opwekkende technologieën op basis van hernieuwbare energie in uw vestiging?

Redenen voor invoering	Energie	Warmte	Belangrijke barrières	Energie	Warmte
Verwachte ontwikkeling van de energieprijzen	☐	☐	Te grote investeringen of voordelen ontbreken	☐	☐
Strategische redenen (bijv. "groen imago")	☐	☐	Administratieve last (bijv. goedkeuringsprocedures)	☐	☐
Terugdringen broeikasgassen	☐	☐	Niet van toepassing in deze bedrijfsvestiging	☐	☐
Eigen energie-opwekking ter vergroting aantal energiebronnen	☐	☐	Vooralsnog geen relevant onderwerp in deze vestiging	☐	☐
Politieke of wettelijke bepalingen	☐	☐	Andere barrières	☐	☐

9.1 Heeft uw bedrijf sinds 2012 producten geïntroduceerd die nieuw waren voor uw bedrijf of die technisch ingrijpend zijn vernieuwd? (Bijv. door nieuwe grondstoffen of materialen te gebruiken, veranderingen in productiefuncties of werking e.d.)

☐ nee ☐ ja → Hoe groot was het aandeel van deze producten in de omzet van het jaar 2014? ca. ☐ %

→ Hoe lang duurde gemiddeld genomen de ontwikkeling van zo'n product? (van productidee tot en met lancering) ca. ☐ maanden

9.2 Hebben deze productvernieuwingen ook geleid tot betere milieu-effecten bij gebruik of verwijderen van deze nieuwe producten?

☐ nee ☐ ja → Welke verbeteringen in de milieu-effecten zijn met deze producten bereikt? (Kruis aan wat van toepassing is)

☐ Vermindering van gezondheidsrisico's bij gebruik
☐ Vermindering van energieverbruik bij gebruik
☐ Vereenvoudiging van onderhoud of herstel
☐ Verlenging productlevensduur
☐ Vermindering van milieuvervuiling bij gebruik (van grond, water, lucht, of geluid)
☐ Verbeterde recycling, terugwinning of verwijderingseigenschappen

9.3 Bevonden zich bij deze nieuwe producten (nieuw sinds 2012) ook producten, die nieuw-voor-de-markt waren en die uw bedrijfsvestiging als eerste op de markt introduceerde?

☐ nee ☐ ja → Wat was hun aandeel in de omzet van 2014? ca. ☐ %

→ Zijn deze producten speciaal ontwikkeld vooral voor (kruis slechts één optie aan):

☐ bestaande klanten binnen uw huidige markt
☐ aantrekken van nieuwe klanten binnen uw huidige markt
☐ toetreding tot markten nieuw voor uw bedrijfsvestiging
☐ het ontwikkelen van geheel nieuwe markten

9.4 Heeft uw bedrijfsvestiging producten in het programma die u al langer dan 10 jaar aanbiedt?

☐ nee ☐ ja → Welk percentage van de omzet hadden deze producten in 2014? ca. ☐ %

10.1 Welke van de volgende productgerelateerde diensten biedt u uw klanten aan?
Als uw bedrijfsvestiging dergelijke diensten aanbiedt, worden zij dan ook aangeboden voor producten van andere bedrijven?

	nee	ja	Voor producten van andere bedrijven		nee	ja	Voor producten van andere bedrijven
Installatie, inbedrijfstelling	☐	☐→	☐	Software-ontwikkeling (bijv. software-aanpassing)	☐	☐→	☐
Onderhoud en reparatie	☐	☐→	☐	Klantondersteuning op afstand (helpdesk, service hotline, website)	☐	☐→	☐
Training	☐	☐→	☐	Reviseren, vernieuwen (incl. functie opwaardering of software-uitbreidingen)	☐	☐→	☐
Ontwerp, technisch advies (incl. testen, simulaties, O&O voor klanten)	☐	☐→	☐	End-of-life dienstverlening (bijv. recycling, opheffen, terugname)	☐	☐→	☐

10.2 Indien u productgerelateerde diensten aanbiedt, hoe hoog schat u het aandeel daarvan in de totale omzet van 2014?
▶ In geval van geen omzet, vul in „0".

Aandeel in totale omzet van diensten die u in 2014 ca. [ ] %
direct, d.w.z. apart, in rekening heeft gebracht

Aandeel van diensten die u in 2014 indirect ca. [ ] %
in rekening heeft gebracht (via de productprijs)

10.3 Heeft uw bedrijfsvestiging vanaf 2012 nieuwe productgerelateerde diensten aangeboden, die geheel nieuw zijn voor uw bedrijfsvestiging of belangrijke verbeteringen bevatten?

[ ] nee [ ] ja → Hoe groot was het aandeel in de omzet van 2014 van deze sinds 2012 nieuw aangeboden ca. [ ] %
productgerelateerde diensten, die uw bedrijfsvestiging direct of indirect in rekening heeft gebracht?

11 Hoe vaak heeft uw organisatie vanaf 2012 de volgende activiteiten verricht?

(0=niet; 1=1 keer; 2=vaker)

Spin-offs	Opstarten van nieuwe organisaties of activiteiten buiten de onderneming	[0] [1] [2]
Uitgaand intellectueel eigendom	Verkopen, of aanbieden van licenties/patenten aan andere organisaties	[0] [1] [2]
Werknemer-betrokkenheid	Benutten van kennis en initiatieven van niet-O&O medewerkers bij het realiseren van innovaties	[0] [1] [2]
Klantbetrokkenheid	Direct betrekken van klanten in uw innovatieprocessen	[0] [1] [2]
Extern netwerken	Het samenwerken met andere organisaties (niet klanten) voor innovatie	[0] [1] [2]
Externe participatie	Deelnemen (met bijv. vermogen, kennis) in ondernemingen om toegang te krijgen tot hun kennis of om andere synergieën te creëren?	[0] [1] [2]
Uitbesteden van O&O	Uitbesteden van O&O (diensten) aan andere organisaties, zoals universiteiten, publieke onderzoeksinstellingen, commerciële ingenieurs of leveranciers?	[0] [1] [2]
Inkomend intellectueel eigendom	Kopen of in licentie nemen van intellectueel eigendom van andere organisaties	[0] [1] [2]

12 Hoe hebben zich in uw bedrijfsvestiging de productiekosten per eenheid product (eenheidskosten) ontwikkeld in 2014?

Gedaald met 10% of meer	Gedaald 5 - < 10%	Gedaald 0 - < 5%	Gelijk gebleven	Gestegen 0 - < 5%	Gestegen 5 - < 10%	Gestegen met 10% of meer
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

13 In de voorafgaande vragen heeft u informatie gegeven over verschillende velden van innovatie. Rangorden deze innovatievelden naar mate van belangrijkheid voor uw bedrijfsvestiging.

Geef met een score van 1 tot 4 de volgorde van belangrijkheid aan met 1 als het belangrijkst; gebruik elke score slechts één keer.

Toevoegen van diensten aan uw producten ○   Organisatie-vernieuwing ○   Technische vernieuwing in het productieproces ○   Ontwikkeling van nieuwe producten ○

14 Welke van de onderstaande informatiebronnen zijn het meest relevant voor belangrijke innovatie-impulsen/ideeën in uw bedrijfsvestiging op de volgende gebieden? (Kruis maximaal drie informatiebronnen aan voor elk gebied van innovatie)

	intern				extern			
	O&O, engineering	productie-afdeling	Klanten-service	Leiding bedrijfsvestiging	Klant of gebruiker	Leverancier	Onderzoeks-instellingen, universiteiten	Conferenties, beurzen
Nieuwe producten	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Nieuwe proces-technologieën	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Nieuwe diensten	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Nieuwe organisatie-concepten	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

15.1 Wat is het opleidingsniveau van het personeel van uw bedrijfsvestiging?

Hoger onderwijs (HBO+WO)	ca. [ ] %	
MBO technische opleiding	ca. [ ] %	
MBO adminstratieve en commerciële opleiding	ca. [ ] %	=100%
LBO of ongeschoold	ca. [ ] %	
Personeel in opleiding (leerlingen, stagiaires)	ca. [ ] %	

15.2 Hoe is het personeel in uw bedrijfsvestiging verdeeld over de volgende werkterreinen:

Onderzoek en ontwikkeling	ca. [ ] %	
Ideevorming, ontwerp en vormgeving	ca. [ ] %	
Fabricage en montage	ca. [ ] %	=100%
Klantenservice	ca. [ ] %	
Overige (administratie, inkoop, logistiek/distributie, onderhoud, productieplanning enz.)	ca. [ ] %	

16 Heeft uw bedrijfsvestiging in de afgelopen twee jaar delen van de productie of delen van onderzoek en ontwikkeling (O&O) overgeheveld naar andere bedrijven (uitbesteding) of eigen vestigingen in het buitenland (verplaatsing) danwel vestigingen vanuit het buitenland teruggeplaatst?

Overheveling:

Redenen: (meerdere opties mogelijk)

nee	Ja: (meerdere opties mogelijk)			Naar welk land (landen)?	Arbeidskosten	Ontsluiting nieuwe markten	Nabijheid belangrijke klanten	Toegang tot nieuwe kennis technologie/n/clusters	Belasting, heffingen, subsidies	Gebrek aan gekwalificeerd personeel in eigen land	Importbeperkingen	Nabijheid van O&O of productie die mede is overgeheveld	Toegang tot natuurlijke hulpbronnen leveranciers	Aanwezigheid van concurrenten
	Naar andere bedrijven in Nederland	Naar andere bedrijven in het buitenland	naar eigen vestigingen in het buitenland											

Overheveling van **productie-activiteiten** sinds 2013

☐ ☐ ☐ ☐ [Naar welk land] ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Verplaatsing **onderzoeks- en ontwikkelingsactiviteiten** sinds 2013

☐ ☐ ☐ ☐ [Naar welk land] ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Terugplaatsing (repatriëring) vanuit het buitenland naar het thuisland

Nee	Ja	Vanuit andere bedrijven in het buitenland	Vanuit eigen vestigingen in het buitenland	Uit welk land/landen	Kwaliteit	Flexibiliteit, leversnelheid	Capaciteitsbenutting	Beschikbaarheid gekwalificeerd personeel	Arbeidskosten	Transportkosten/ logistieke kosten	Kosten van coördinatie en toezicht	Nabijheid van binnenlandse O&O	Verlies van kennis/ -kopiëren/piraterij	Infrastructuur

Terugplaatsing van (delen van) de **productie** sinds 2013

☐ ☐ → ☐ ☐ [Uit welk land] ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

---

17 Geef a.u.b. de herkomst van uw toeleveringen (inputs) en de bestemming van uw producten in 2014.
▶ Toeleveringen zijn gekochte onderdelen, (ruwe) materialen, productiemiddelen en diensten. Geef alleen het aandeel aan van producten gemaakt in uw bedrijfsvestiging.

Toeleveringen afkomstig uit

binnenland ca [   ] % } = 100% van de
buitenland ca [   ] %   inkoopwaarde

Producten verkocht in:

binnenland ca [   ] % } = 100% van
buitenland ca [   ] %   de omzet

18.1 Heeft uw bedrijfsvestiging onderzoek en ontwikkelingsactiviteiten (O&O) uitgevoerd of laten uitvoeren door externe partners in 2014?

☐ nee   ☐ ja → O&O-uitgaven in procenten van de omzet in 2014   ca. [   ] %

18.2 Heeft uw bedrijfsvestiging sinds 2012 continu O&O uitgevoerd of laten uitvoeren door externe partners?

☐ nee   ☐ ja

---

19 Welk van de volgende kenmerken zijn het meest van toepassing op uw hoofdproduct(groep)?

Productontwikkeling (kruis slechts één optie aan)
- Op specificatie van klant ☐
- Voor een standaardprogramma waarbinnen klantspecifieke wensen gerealiseerd kunnen worden ☐
- Voor een standaardprogramma, waaruit de klant kan kiezen ☐
- Niet aanwezig in deze bedrijfsvestiging ☐

Fabricage/montage (kruis slechts één optie aan)
- Na binnenkomst klantorder (make-to-order) ☐
- Eindmontage van het product wordt uitgevoerd na binnenkomst klantorder (assemble-to-order) ☐
- Op voorraad (make-to-stock) ☐
- Niet aanwezig in deze bedrijfsvestiging ☐

Seriegrootte (kruis slechts één optie aan)
- Enkelstuksproductie ☐
- Kleine of middelgrote series (20-1.000 stuks per maand) ☐
- Grote series (meer dan 1.000 stuks per maand) ☐
- Geen discrete productie (procesindustrie) ☐

Productcomplexiteit (kruis slechts één optie aan)
- Eenvoudige producten ☐
- Producten van middelgrote complexiteit ☐
- Complexe producten ☐

20 Beantwoordt u de volgende vragen over uw hoofdproduct(groep).

Wat is de gemiddelde productietijd van uw hoofdproduct(groep)? (doorlooptijd vanaf moment dat opdracht binnenkomt bij productie tot product klaar is voor levering)   ca. [ ] werk-dagen   of [ ] uren

Hoeveel procent van de orders wordt op tijd afgeleverd?   ca. [ ] %

Hoeveel procent van uw productie moet na kwaliteitscontrole nabewerking ondergaan of geheel worden afgekeurd?   ca. [ ] %

Welk percentage van de geleverde bestellingen heeft klachten van klanten opgeleverd vanwege kwaliteitsproblemen?   ca. [ ] %

21 Hier worden enkele gegevens over uw bedrijfsvestiging gevraagd:

Jaaromzet   2014 [ ] miljoen €   2012 [ ] miljoen €

Aantal werknemers (excl. uitzendkrachten)   2014 [ ] aantal

Aantal werknemers dat is afgevloeid in 2014   2014 [ ] aantal

Had uw bedrijfsvestiging uitzendkrachten in dienst in 2014? [ ] nee [ ] ja → Hoeveel uitzendkrachten waren in 2014 gemiddeld in dienst bij uw bedrijfsvestiging? ca. [ ] aantal

Inkoop 2014 (ingekochte onderdelen, materialen en diensten) [ ] miljoen €   Personeelskosten als percentage van de omzet in 2014 (incl. loonnevenkosten) [ ] %

Afschrijvingen op machines en installaties 2014 (zonder grond en gebouwen) [ ] miljoen €   Graad van capaciteitsbenutting (gemiddeld in 2014) [ ] %

Investeringen in machines en installaties 2014 [ ] miljoen €   Totale energiekosten als percentage omzet 2014 [ ] %

Rendement op de omzet (vóór belasting in 2014) [ ] negatief [ ] 0 tot 2% [ ] > 2 tot 5% [ ] > 5 tot 10% [ ] > 10%

Jaar van oprichting, c.q. inschrijving bij de Kamer van Koophandel jaar: [ ]   Heeft uw bedrijfsvestiging een ondernemingsraad? [ ] nee [ ] ja

22.1 Geef uw energieverbruik aan als volgt:

Wat was het aandeel groene stroom in het totale stroomverbruik van uw bedrijfsvestiging in 2014? ca. [ ] %   Hoe groot is de te verwarmen oppervlakte van uw bedrijfsvestiging? ca. [ ] m²

22.2 Hoe heeft het stroomverbruik van uw bedrijfsvestiging zich ontwikkeld in 2014?

Gedaald met 10% of meer	Gedaald 5 - < 10%	Gedaald 0 - < 5%	Gelijk gebleven	Gestegen 0 - < 5%	Gestegen 5 - < 10%	Gestegen met 10% of meer
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

22.3 Hoe heeft het olie- en gasverbruik van uw bedrijfsvestiging zich ontwikkeld in 2014?

Gedaald met 10% of meer	Gedaald 5 - < 10%	Gedaald 0 - < 5%	Gelijk gebleven	Gestegen 0 - < 5%	Gestegen 5 - < 10%	Gestegen met 10% of meer
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

23 Wie is in meerderheid of exclusief eigenaar van het bedrijf waartoe uw bedrijfsvestiging behoort?

[ ] Private eigenaar/ familie   [ ] Financiële investeerder (bijv. durfkapitaal)   [ ] Ander bedrijf (bijv. niet-financiële investeerder)   [ ] stichting   [ ] overige eigenaren   [ ] Geen meerder-heidseigenaar

↳ Is de familie actief in het management? [ ] Nee [ ] Ja

Hartelijk dank voor uw bijdrage aan dit onderzoek.

Wij verzoeken u de ingevulde vragenlijst terug te sturen per e-mail naar: P.Vaessen@fm.ru.nl

of per post naar:

Radboud Universiteit Nijmegen, t.a.v Dr P.Vaessen, Antwoordnummer 1908, 6500 VC Nijmegen

Appendix B: Item-total statistics social innovations

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Method of 5S	7,5706	13,030	,428	,787
Standardized and detailed working instruction	7,2090	13,291	,461	,786
Integration of tasks (planning, operating or controlling functions with the machine operator)	7,2542	13,395	,388	,790
Method of Value Stream Mapping/Design	7,4463	12,953	,450	,786
Customer- or product-oriented lines/cells in the factory	7,4520	13,579	,268	,798
Production controlling by pull principles	7,4237	13,121	,404	,789
Method for optimizing of change-over time	7,7627	13,318	,417	,788
Visual Management	7,5537	12,862	,475	,784
Methods of assuring quality in production	7,3446	12,898	,496	,783
Methods of operation management for mathematical analyses of production	7,8079	13,236	,488	,784
Methods of continuous improvement of production processes	7,4350	12,554	,572	,777
Certified energy management system	7,9379	14,354	,207	,799
Instruments of life-cycle assessment	7,8983	14,069	,278	,796
Impact and performance measurements of social and environmental corporate activities	7,6554	13,079	,435	,787
Instruments to maintain elderly employees or their knowledge in the factory	7,5141	13,501	,288	,797
Instruments for promoting staff commitment	7,3051	13,884	,210	,801
Standardized methods of job design for improving health or safety conditions at work	7,7910	13,541	,364	,791
Broad-based employee financial participation schemes	7,7345	13,957	,197	,802

Appendix C: Item-total statistics technological innovations

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Industrial robots for manufacturing processes	4,2542	8,895	,311	,702
Industrial robots for handling processes	4,3785	8,998	,329	,700
Control system for shut down of machines in off-peak periods	4,5537	9,703	,173	,712
Control-automation systems for an energy efficient production	4,5254	9,285	,373	,700
Technologies for recuperation of kinetic and process energy	4,3842	9,442	,154	,716
Manufacturing technologies for micromechanical and microelectrical components	4,5763	9,700	,233	,710
Technologies for generation energy\ heat	4,5311	9,887	,033	,721
Nano-technological production processes	4,5537	9,510	,304	,705
Processing techniques for composite materials	4,5254	9,785	,086	,718
Biotechnology / genetic engineering methods	4,6045	9,809	,305	,711
Processing techniques for alloy construction materials	4,4407	9,396	,206	,711
Additive manufacturing technologies for prototyping	4,4181	9,154	,293	,704
Additive manufacturing technologies for mass production	4,3842	9,340	,194	,713
System for Machine2Machine communication	4,4633	9,102	,363	,698
Software for production planning and scheduling	3,8757	9,269	,209	,712
Near real-time production control system	4,2712	8,676	,398	,693
Systems for Cyber-Physical systems, cloud-computing	4,4802	9,319	,279	,705
Digital Exchange of product/process data with suppliers / customers	4,2881	8,729	,385	,694
Systems for automation and management of internal logistics	4,3503	9,024	,301	,703
Mobile/wireless devices for programming and operation	4,4633	9,409	,218	,710
Product-Lifecycle-Management-System	4,4633	9,148	,341	,700
Technologies for safe human-machine interaction	4,5028	9,342	,298	,704
Digital solutions for providing drawings, work schedules or work instructions directly on the shopfloor	4,2599	8,705	,384	,695

Appendix D: Frequencies social innovations

The item number of the innovation comes from question 3 from the EMS (appendix A)

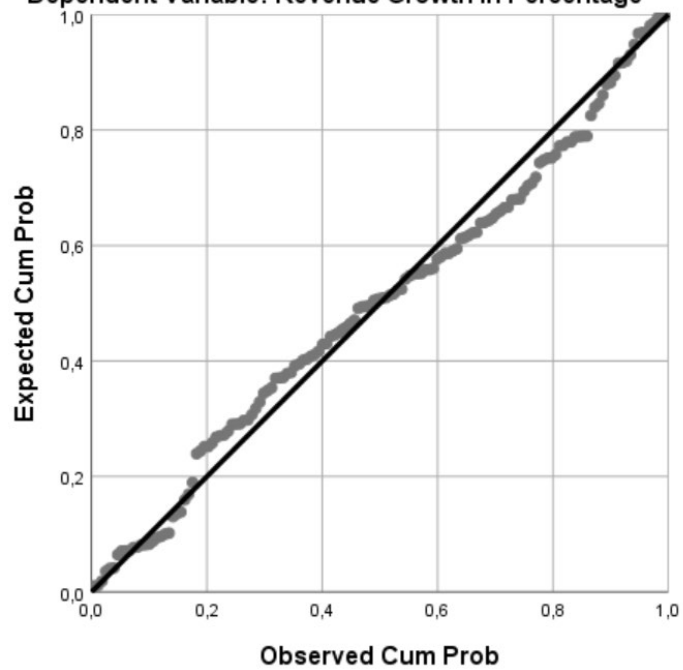| Social innovation	Frequency
1. Method of 5S	77
2. Standardized and detailed working instruction	141
3. Integration of tasks (planning, operating or controlling functions with the machine operator)	133
4. Method of Value Stream Mapping/Design	99
5. Customer- or product-oriented lines/cells in the factory	98
6. Production controlling by pull principles	103
7. Method for optimizing of change-over time	43
8. Visual Management	80
9. Methods of assuring quality in production	117
10. Methods of operation management for mathematical analyses of production	35
11. Methods of continuous improvement of production processes	101
12. Certified energy management system	12
13. Instruments of life-cycle assessment	19
14. Impact and performance measurements of social and environmental corporate activities	62
15. Instruments to maintain elderly employees or their knowledge in the factory	87
16. Instruments for promoting staff commitment	124
17. Standardized methods of job design for improving health or safety conditions at work	38
18. Broad-based employee financial participation schemes	48

Appendix E: Frequencies technological innovations

The item number comes from question 8.1 from the EMS (appendix A)

Technological innovation	Frequency
1. Industrial robots for manufacturing processes	64
2. Industrial robots for handling processes	42
3. Control system for shut down of machines in off-peak periods	11
4. Control-automation systems for an energy efficient production	16
5. Technologies for recuperation of kinetic and process energy	41
6. Manufacturing technologies for micromechanical and microelectrical components	7
7. Technologies for generation energy\ heat	15
8. Nano-technological production processes	11
9. Processing techniques for composite materials	16
10. Biotechnology / genetic engineering methods	2
11. Processing techniques for alloy construction materials	31
12. Additive manufacturing technologies for prototyping	35
13. Additive manufacturing technologies for mass production	41
14. System for Machine2Machine communication	27
15. Software for production planning and scheduling	131
16. Near real-time production control system	61
17. Systems for Cyber-Physical systems, cloud-computing	24
18. Digital Exchange of product/process data with suppliers / customers	58
19. Systems for automation and management of internal logistics	47
20. Mobile/wireless devices for programming and operation	27
21. Product-Lifecycle-Management-System	27
22. Technologies for safe human-machine interaction	20
23. Digital solutions for providing drawings, work schedules or work instructions directly on the shopfloor	63

Appendix F: Normal probability plots

Normal P-P Plot of Regression Standardized Residual

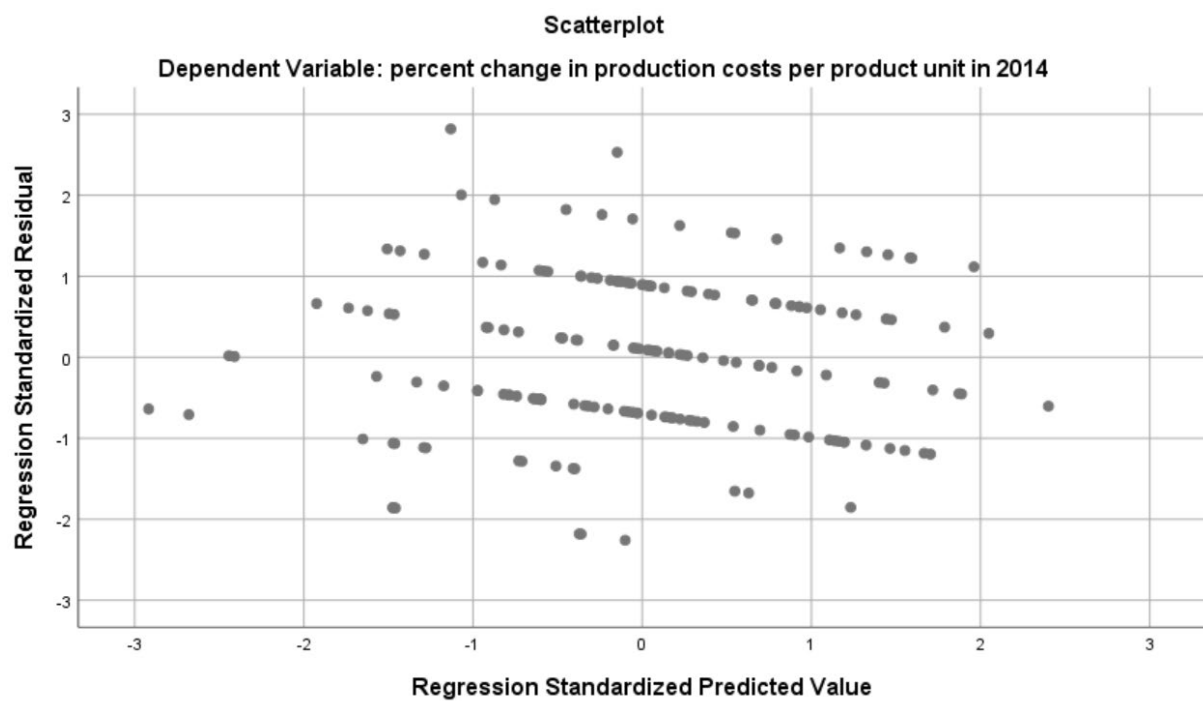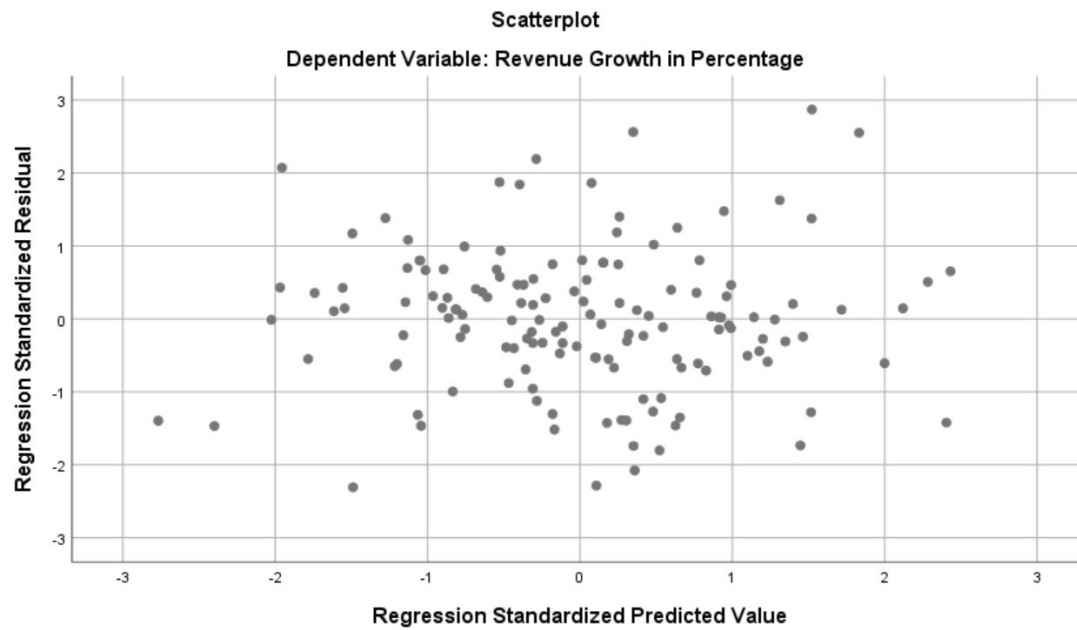Dependent Variable: Revenue Growth in Percentage

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: percent change in production costs per product unit in 2014

Appendix G: Scatterplots

Scatterplot

Dependent Variable: Revenue Growth in Percentage

Scatterplot

Dependent Variable: percent change in production costs per product unit in 2014

Appendix H: Regression analysis output revenue growth

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,244[a]	,060	-,003	19,02198	2,237

a. Predictors: (Constant), Electronic, Social innovations Applied, Construction, Food, Chemical, Textile, Number of employees Transformed, Machinery, Technological Innovations Applied

b. Dependent Variable: Revenue Growth in Percentage

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3114,567	9	346,063	,956	,479[b]
	Residual	49209,675	136	361,836		
	Total	52324,242	145			

a. Dependent Variable: Revenue Growth in Percentage

b. Predictors: (Constant), Electronic, Social innovations Applied, Construction, Food, Chemical, Textile, Number of employees Transformed, Machinery, Technological Innovations Applied

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	11,758	7,194		1,634	,104		
	Social innovations Applied	-,919	,547	-,186	-1,679	,095	,566	1,767
	Technological Innovations Applied	,072	,656	,012	,111	,912	,543	1,841
	Number of employees Transformed	2,710	4,950	,057	,547	,585	,627	1,595
	Food	9,039	5,990	,149	1,509	,134	,708	1,413
	Textile	-1,001	5,839	-,017	-,171	,864	,672	1,487
	Construction	-7,731	6,496	-,112	-1,190	,236	,778	1,285
	Chemical	1,846	5,870	,031	,314	,754	,699	1,430
	Machinery	1,700	5,021	,035	,339	,735	,652	1,533
	Electronic	-,773	5,162	-,015	-,150	,881	,677	1,477

a. Dependent Variable: Revenue Growth in Percentage

Appendix I: Regression analysis output production costs

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,288[a]	,083	,034	1,25598	1,879

a. Predictors: (Constant), Electronic, Social innovations Applied, Construction, Food, Textile, Chemical, Number of employees Transformed, Machinery, Technological Innovations Applied

b. Dependent Variable: percent change in production costs per product unit in 2014

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23,824	9	2,647	1,678	,098[b]
	Residual	263,441	167	1,577		
	Total	287,266	176			

a. Dependent Variable: percent change in production costs per product unit in 2014

b. Predictors: (Constant), Electronic, Social innovations Applied, Construction, Food, Textile, Chemical, Number of employees Transformed, Machinery, Technological Innovations Applied

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4,355	,426		10,223	,000		
	Social innovations Applied	-,102	,033	-,307	-3,080	,002	,554	1,806
	Technological Innovations Applied	,030	,041	,074	,729	,467	,527	1,896
	Number of employees Transformed	,183	,296	,057	,616	,539	,636	1,572
	Food	,017	,370	,004	,046	,964	,713	1,403
	Textile	-,229	,348	-,059	-,658	,512	,678	1,476
	Construction	,049	,406	,010	,121	,904	,796	1,256
	Chemical	-,337	,349	-,087	-,965	,336	,671	1,491
	Machinery	-,111	,307	-,033	-,361	,719	,653	1,530
	Electronic	-,061	,302	-,018	-,200	,841	,659	1,518

a. Dependent Variable: percent change in production costs per product unit in 2014

Appendix J: Interview instructions (in Dutch)

Mijn naam is Stan Claassen, masterstudent op de Radboud Universiteit in Nijmegen. Vanuit mijn masteropleiding 'Strategic Management' schrijf ik een onderzoeksthesis en hier zou ik u graag voor interviewen. Dit interview gaat over het onderwerp sociale innovaties en dingen die daarbij komen kijken binnen een bedrijf. Gedurende het interview zal er duidelijk worden gemaakt wat de verscheidene begrippen inhouden en verdere uitleg is altijd mogelijk mocht daar behoefte aan zijn. Dit interview is geheel vertrouwelijk en alle antwoorden zullen puur en alleen voor dit onderzoek gebruikt worden. Voor u als respondent zullen er verder geen gevolgen aan zitten en ook het bedrijf waar u werkt zal anoniem worden gehouden. Het interview bestaat uit enkele inleidende vragen en vervolgens zal er meer **onderzoeksgerelateerd** gevraagd worden, vervolgens wordt er afgerond.

Hartelijk dank voor uw medewerking,

Stan Claassen

Gedurende het interview zal er gereageerd worden op de antwoorden die de respondent geeft. Mocht er bijvoorbeeld een antwoord niet helemaal volstaan of duidelijk zijn dan kan hierop doorgevraagd worden. Uiteraard zal het interview in een gemoedelijke sfeer verlopen en de respondent zal niet worden gedwongen een antwoord te geven wanneer hij/zij dit niet wil of kan zeggen. Vanuit een vooraf gemaakte vragenlijst zal er geïnterviewd worden met hier en daar nog ruimte voor een kleine afwijking hiervan. Aan het eind van deze thesis is het mogelijk voor de respondent de resultaten en uitkomsten in te zien mocht hier interesse voor zijn.

Voordat we beginnen met het interview: De audio van dit interview zou ik graag willen opnemen, is dat akkoord? Ook hierbij geldt dat de inhoud alleen voor dit onderzoek gebruikt wordt en dit wordt verder niet openbaar gemaakt.

Appendix K: Interview questions (in Dutch)

Voor de interviews is er een indeling gemaakt gebaseerd op de belangrijke onderdelen van deze thesis, zowel de afhankelijke als de onafhankelijke variabelen komen naar voren. Ook de sociale innovatie categorieën van Volberda et al. (2013) komen duidelijk naar voren. De interviews zijn afgenomen na de analyse van de EMS-data dus de EMS-items van vraag 3 over sociale innovaties zijn meegenomen. Niet alle EMS-items zijn meegenomen in de vragen omdat ze niet allemaal onder een sociale innovatie categorie vallen.

Inleiding:

1. In welke industrie is uw bedrijf werkzaam?
2. Hoeveel medewerkers zijn er op deze locatie?
3. Hoe kijkt u aan tegen sociale innovaties?
4. Hebben sociale innovaties prioriteit in uw bedrijf? Komen deze innovaties voor?

Flexible organizing category:

5. Wat voor structuur/hiërarchie is er aanwezig? Is deze structuur recent nog veranderd?
6. Zijn de werkinstructies gestandaardiseerd en gedetailleerd? (EMS-item 2)
7. Is er een grafische weergave van de structuur en de status van werk? (EMS-item 8)
8. Wordt de werkcyclus regelmatig geanalyseerd en waar nodig verbeterd? (EMS-item 13)

Dynamic management category:

9. Worden er trainingen/cursussen aangeboden door het bedrijf? Is er verder nog oog voor taakverrijking van de medewerkers (EMS-item 3)
10. Wordt u goed ingewerkt wanneer u nieuw bent of wanneer u van functie veranderd?
11. Worden de skills die u bezit doorgegeven aan andere medewerkers? En als een werknemers vertrekt, hoe wordt de kennis behouden? (EMS-item 15)

Working Smarter category:

12. Wordt er veel aan efficiëntie gedacht? Zijn er recent nog grote veranderingen geweest om efficiënter te worden? (EMS-item 6, 7 & 11)
13. Worden medewerkers betrokken om de interne logistiek te verbeteren/innoveren? (EMS-item 4)
14. Zijn er voorschriften voor werkplekinrichting of productie eenheid inrichting? (EMS-item 1 & 5)

<u>Co-creation category:</u>

15. Wordt er goed samengewerkt door afdelingen?

16. Hoe is de communicatie hier geregeld? Komen hier veel problemen voor?

17. Wordt het operationeel management geanalyseerd met cijfers erbij? (EMS-item 10)

18. Is er een duidelijk energie management beleid? Is dit voor het hele bedrijf zo? (EMS-item 12)

<u>Revenue Growth:</u>

19. Hoeveel omzet heeft u afgelopen jaar ongeveer gedraaid? Is dit een stijging of daling vergeleken met eerdere jaren?

<u>Production costs:</u>

20. Wordt er veel gedaan om de productiekosten te verlagen? Worden medewerkers hierbij betrokken?

21. Zijn de productiekosten de laatste jaren veranderd door innovaties?

<u>Technologische innovaties:</u>

22. Zijn er verder recent nog technologische innovaties doorgevoerd?

23. Op welk gebied worden de meeste technologische innovaties doorgevoerd?

24. Is het aantal technologische innovaties ongeveer gelijk aan het aantal sociale innovaties? Hoe worden deze twee soorten samen gebruikt?

<u>Afronding:</u>

25. Hoe ziet de toekomst voor uw bedrijf eruit? Heeft de Corona-crisis veel blijvende verandering meegebracht?

26. Zijn er nog genoeg innovatie mogelijkheden om door te ontwikkelen als bedrijf?

27. Denkt u dat sociale innovaties een grotere prioriteit zouden moeten krijgen?

Appendix L: Coding instructions (in Dutch)

De interview transcripten worden gecodeerd aan de hand van de key concepts van deze thesis. 'Firm size' en 'type of industry' hebben geen aparte kleur gekregen aangezien deze variabelen beide met slechts één vraag zijn te meten. In de interviewvragen is er voor 'sociale innovaties' al een verdeling gemaakt per categorie van Volberda et al. (2013) en ook de EMS-items zitten hier al in verwerkt. Het is per interviewvraag dus al duidelijk bij welke sociale innovatie categorie of welk EMS-item het hoort.

Variable	Color
Social innovations	🟡
Revenue growth	🟢
Production costs	🔵
Technological innovations	🔴
Firm size	
Type of industry	

Appendix M: Coded transcript interview 1 (in Dutch)

Appendix N: Coded transcript interview 2 (in Dutch)

Appendix O: Coded transcript interview 3 (in Dutch)

Appendix P: Coded transcript interview 4 (in Dutch)