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SMEs' Experiences of Swedish Innovation Policies from a Transformative and Systematic Approach

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Abstract: Society is facing diverse vital societal challenges, which has led to an increased focus on how policy makers should target these challenges. Innovation policies have gone through a development from firm based R&D towards a more systematic and transformative approach towards innovation. This research has investigated how policy instrument in the form of innovation programs have been experienced by SMEs, as well as their impact on the innovation process. The data have been collected through interviews with SMEs that have been involved in the chosen innovation programs, which are managed by the Swedish governmental agency Vinnova. The study primarily uses Schot and Steinmueller's (2016) three frames of innovation policy in order to analyze the empirics. Especially the third frame, related to systematic and transformative change is applied. The research shows that the chosen innovation programs' aims are aligned with the third frame of innovation policy. Furthermore, the experiences of the interviewed SMEs show that they are aligned with the transformative approach towards innovation. The systematic approach has not been experienced as successful to the same extent since the SMEs have experienced problems with collaboration with academia and research institutes.

Key words: Innovation, Societal Challenges, SME, Sweden, Innovation Policy, Systematic Approach, Transformative Change, Innovation Program

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1. Introduction

Recently, in order to get a broader understanding on how to tackle the grand challenges that society is facing today there has been a growing body of research on how policy makers should act regarding these challenges (OECD 2011; Kuhmann & Rip 2014). Especially the European Union and the OECD have emphasized the importance of innovation policies that directly target the grand societal challenges (OECD 2011). This have led to that national, regional and local authorities have started to embrace this way of thinking concerning innovation policies (Cagnin et al. 2012; Coenen et al. 2015). Therefore, in order to achieve a sustainability transition, new types of policies have been in need for a developed approach that foster more challenge-driven innovation and integrate a variety of different actors (OECD 2016). The development of innovation policies, that stimulate innovations that target grand societal challenges, have been classified as a field that challenges the science and innovation policies as we know it (Kuhmann & Rip 2014). Innovation policies have developed from a focus on firm based R&D towards a more systematic approach where innovation policies need a more collective initiative towards a transformative change.

Several researchers, with diverse areas of expertise, have examined different innovation policies that in particular aim to stimulate innovation for a sustainable development. For example, Howlett & Ramesh (2003) present policy instruments that tackle challenges within an environmental aspect and argues that policy instruments should be modified for the specific problem, which Borrás & Edquist (2013) as well as Jacobsson & Bergek (2011) agrees on. Foxon et al. (2004) highlight the need for market-based instruments, such as taxes. Borrás & Edquist (2013) highlights public procurements of innovation as useful in tackling the grand societal challenges. Moreover, a small research niche, which identifies innovation programs, i.e. directed funding towards specific problems that need sustainable solution, do exist but the field is limited (Mees et al. 2014; Coenen et al. 2017; OECD 2016). Furthermore, some scholars have recently started to argue for the need of a more systematic and transformative approach when it comes to tackling grand societal challenges through innovation policy (Schot & Steinmueller, 2016).

Considering the above and in order to add breadth to the literature, this study will evaluate innovation policies, which in particular aims to support innovations that tackle grand societal

challenges through innovation program i.e. public funding. Furthermore, since a systematic and transformative approach have been highlighted as of importance when tackling grand societal challenges through innovation policy, this study will evaluate policies in relation to this approach (Schot & Steinmueller, 2016). More specifically, this study will examine the experienced impact of innovation programs as innovation policy instruments, in relation to a theoretical framework concerning systematic and transformative approach towards innovation. Moreover, this study will in particular add breadth to the literature by studying how Swedish actors, more specifically actors represented as small and medium sized companies (SMEs), have experienced the impact and involvement of the chosen innovation programs, managed by the innovation agency Vinnova.

Although Sweden is classified as one of the countries that have come far in their development concerning both tackling grand societal challenges (OECD 2016) as well as in producing innovation (Jamrisko & Lu 2017), it has its own unique development and future potential improvements. Furthermore, the combination of innovation and SMEs have been argued to be the key for the Swedish development (Riksrevisionen 2016), which makes it relevant to include SMEs' experience of innovation policy in this study.

Furthermore, research on the case of Sweden and the country's innovation policies for a transformative change does indeed exist but there is a limited range and the angles are diverse. Coenen et al (2017) have in their study, concerning innovation policy that address societal challenges in Sweden, developed an analytical framework that specifies the conditions that enable or do not enable this type of innovation. The Swedish Government itself has emphasized the need to contribute to innovative solutions in order to tackle the challenges that society is facing (Government Offices of Sweden 2012). In addition, the Swedish government argues that the opportunities for innovation (in general) increase when the government gives out financial support (Government Offices of Sweden 2012). Additionally, in a report written by OECD (2016), the recommendations were, concerning the improvements in the Swedish innovation policy, to increase funding for SMEs through major innovation programs and collaboration with researchers. In addition, there have been studies on how SMEs have been crucial for past transitions, due to their innovative and entrepreneurial characteristics (Boons et al. 2013; Marle et al. 2004). The studies that have been done on the case of Sweden have focused on innovation policies, that tackle societal

challenges, strengths and weaknesses. However there has not been an abundant focus on how these innovation policies are appropriate for all actors on the market.

Conclusively, the principal aim of this study is to investigate initiatives for the transformative and systematic approach towards innovation in Sweden in the form of innovation programs. More specifically, this study will investigate how these policy instruments have been effective in the innovation process as well as how they have operated around SMEs. To do this, the following question has been made.

How have the aims and setup of the studied innovation programs, tackling societal challenges, been experienced by the participating SMEs?

The following remainder of the report is structured as follows. Section two presents the theoretical framework drawing on innovation, transformative change as well as the frames of innovation policies. Section three gives a description of the applied method and the collected data. Section four provides a description of the two innovation programs that have been studied; Strategic Innovation Program, as well as the innovation program Challenge Driven Innovation. In section five the results are presented. In section six the analytical framework is applied on the policy practices of the above mentioned innovation programs. Finally, section seven provides the conclusions as well as suggestions on further research.

2. Analytical Background

In this chapter the theoretical and analytical background is presented. First of all, a general discussion, regarding innovation, sustainability and policies, is presented. Secondly, the frames of innovation policy are stated and discussed.

2.1 Innovation, Sustainable Development & Policies

Innovation is an implementation of a new or improved product, good, service or method (OECD & Eurostat 2005). There are different degrees of innovation depending on its novelty and to what extent the innovation is new to the market, to the firm or to the world. Innovation can also be divided into different types of innovation, such as *product* innovation, *process* innovation, *organizational* innovation and *marketing* innovations. The impact of innovation can be either *incremental* or *radical* (OECD & Eurostat 2005). Incremental innovations are not something that is totally new for the market it is rather more of a *simplified and improved change of an already existing innovation*. Radical innovations can on the other hand create *fundamental changes* on a market or for a firm. Innovations are constantly making changes in the environment and peoples' way of living (Huisingh et al. 2013). These changes can happen suddenly and dramatically and change the way a business is managed and how it function. This could in that sense create changes for consumers and in their behavior. In addition, innovations have been identified as a factor that generates new and better ways to create value for a sustainable development. The concept sustainable development is better specified as "the development that meets the needs of the present without challenging the ability of future generations possibilities to meet their own needs" (Regeringskansliet 2004). Moreover, this concept of sustainable development is generally divided into three areas of sustainability: economic, social and environmental sustainability.

Furthermore, innovations have been acknowledged as a crucial factor in tackling, for instance, the environmental challenges (limiting greenhouse gas emissions, improve quality and availability of water, maintaining biodiversity etc.) that the society is facing (OECD & World Bank 2013). According to OECD and World Bank (2013) have innovations contributed more specifically through new technologies that, for example, have decreased the greenhouse gas emissions in production processes, which show how innovations can contribute to a

sustainable transition. There are also non-technological innovations that can contribute to tackling the societal challenges. A non-technological innovation, also known as organizational innovation, function as a contribution to the technological innovation in order to make it effective. This contribution means more specifically the implementation of the new non-technological innovation into a business model and everyday work life. This has been verified as generating improved outcomes and changes in how to tackle societal challenges (OECD & World Bank 2013).

Innovation policies are in this paper defined as the actions that are taken by public actors in order to influence innovation processes. These public actions are aimed to support a wider use of innovations by creating services or products that contribute to improvements and development (Edler 2013). Innovation policy can be divided into two approaches. The broad approach concerns all policies that affect innovation. The other approach are considered as more narrow in a way that it concerns policies that have been created with the purpose to have direct impact on innovation (Makó & Illéssy 2015). The question of policies impact on innovation for tackling societal challenges has been discussed. In order to address these challenges a more systematic approach towards innovation is needed (Schot & Steinmueller 2016). This means further that different actors need to cooperate rather than focus on firm based R&D. Innovation policies have in that sense gone through a historical development, where focus have been on R&D and a more linear approach towards innovation. Now we can identify a more transformative and systematic approach in the development of innovation. The systematic approach towards innovation emphasizes the important role of actors and networks, which function as an innovation system of knowledge and technologies with the purpose to develop innovations (Boons et al. 2013).

2.2 The Three Frames of Innovation

As previously mentioned, some researchers believe that there has been a development in how we view innovation policies. Among these researchers, we find Schot & Steinmueller (2016) who argue that new frames of innovation policy have been developed over the last two decades. Many innovation policies have historically been based on a supply driven model with a main focus on R&D and competition between nations. However, according to Schot & Steinmueller (2016), this form of innovation policy fails to creatively approach the broader

suite of innovation policies that are available. Moreover, it is also an uncertainty in how to govern and implement innovation policies that deal with grand challenges in society, which is due to a lack of creativity and a broad way of thinking. Schot & Steinmueller (2016), as well as Schot (2017), further argues that innovation policies could and should be divided into three developed frames. The first frame of innovation, innovation policy 1.0, which Schot & Steinmueller (2016) labels as 'Innovation for Growth', is designed to provide incentives to meet the market supply of R&D. The second frame of innovation, innovation policy 2.0, which Schot & Steinmueller (2016) labels as 'National Systems of Innovation', has the purpose to improve knowledge production and improve the commercialization and the shift from discovery to the actual application of the invention. Finally, the third frame of innovation, innovation policy 3.0, which Schot & Steinmueller (2016) labels as 'Transformative Change', is still developing. However, in recent years the outlines of this framing have been made clearer. This frame of innovation focuses on mobilizing the power of innovation to address a wide range of societal challenges, such as climate change and inequality (Schot, 2017).

According to Schot & Steinmueller (2016), the emergence of a new innovation framing does not necessarily replace the framing already in place. However, it should be noted that these framings compete with each other over the attention and imagination of policymakers, and in extension citizens (Schot & Steinmueller 2016). Therefore, it is not unlikely that the actual practice of innovation and innovation policy becomes a mixture of all these innovation framings, which is interesting considering this study's purpose and research topic.

In the upcoming sections, these three frames of innovation will be presented more thoroughly.

2.2.1 The First Frame of Innovation: Innovation Policy 1.0

As mentioned, the first frame of innovation is focused on innovation for growth, which in extension means that it taps into the potential of science and technology, in order to achieve prosperity through a system based on mass production and consumption (Schot and Steinmueller 2016). In other words, this frame of innovation is designed to create incentives for the market to produce socially and economically desired levels of science knowledge, i.e. R&D (Schot, 2017).

This framing is of a linear nature, as it gives rise to the linear model in which technology is the application of scientific knowledge (Schot 2017). Furthermore, this means that the framing prioritizes discovery of an invention, rather than the application of the invention, partly because the dividends are believed as realized through an adequate functioning of the market system. Therefore, only in the case of market failure is the government required to act in order secure the societal rewards of the invention (Schot 2017).

The model of the first frame of innovation is, as touched upon, the commercialization of scientific discoveries (Schot & Steinmueller 2016). Furthermore, the processes following discovery are driven by economic logic of investment and the potential of financial return in the following potential innovation or market (Schot & Steinmueller 2016). In that sense, it is expected that this science-led process should considerably contribute to the long-term economic growth as well as providing plentiful business opportunities (Schot & Steinmueller 2016). However, it should be noted that the first frame of innovation historically has had few concerns regarding the scientific advances' effects on things such as the environment and human health, as economic progress and growth were prioritized. This changed in the late 1970s however, as events such as the Chernobyl nuclear disaster and the dilution of the ozone layer occurred (Schot & Steinmueller, 2016).

The division of labor and responsibility should be clearly divided in the first frame of innovation policy. Academia and scientists are expected to focus on the discovery of invention, not bothering too much about the commercial value of such discoveries (Schot & Steinmueller 2016). Meanwhile, the government and the public sector are expected to fund the scientific research as well as regulating it to assure openness. Furthermore, the public sector is also expected to identify problems arising from the potential application of the scientific innovation in order to support long-term economic growth (Schot & Steinmueller 2016). Finally, the private sector is, naturally, the ones expected to commercialize the application of the invention, turning it into an innovation. Traditionally, larger incumbent firms were the ones expected to do this, but over time technology based firms, often in the form of entrepreneurs or SMEs, have also showed their capabilities in this area (Schot & Steinmueller 2016).

In short, the central theme regarding the actors of the first frame of innovation policy is the

clear and distinct division of labor and responsibility. As a result, knowledge sharing has suffered.

2.2.2 The Second Frame of Innovation: Innovation Policy 2.0

In short it can be said that the second frame of innovation policy has the purpose to improve knowledge production in order to improve the commercialization and the shift from discovery to the actual application of the invention. Compared to the first frame of innovation policy, innovation policy 2.0 is different in four major ways. First, in contrast to viewing scientific and technological knowledge as global public good, it is recognized that such knowledge often contains important tacit elements, meaning that it is not able to travel over geographical and cultural distances, but instead is sticky and requires a common context (Von Hippel 1994). Secondly, and related to the previous statement, it is stated that the ability to absorb knowledge from the worldwide network of knowledge and research depends on absorptive capabilities, which requires prior experience in related areas (Cohen & Levinthal 1989). Thirdly, it is recognized that 'absorptive capacities' is related to a range of social capabilities that stems from education but also things such as quality of the education and the social capability of entrepreneurship (Schot & Steinmueller, 2016). The fourth and final major difference is the recognition of technological change as being cumulative and path-dependent (Arthur 1983).

The above-mentioned modifications of the model of innovation suggest that the capacity to innovate is somewhat dependent on the processes of learning and the relation between different organizations in a society (Schot & Steinmueller 2016). Furthermore, the model of the second frame of innovation, in comparison to the first frame of innovation, moves away from the linear approach towards a more interactive model (Schot & Steinmueller 2016). Moreover, the central theme in framing two is the creation of knowledge networks that facilitate interaction, coordination and cooperation between the different actors. This notion is related to theories concerning the Triple Helix term, coined by (Etzkowitz & Leydesdorff 1997). The triple helix term refers to the interaction and cooperation of the government, industry, and academia. The model does further describe the efficient interaction of mutual learning and collected knowledge, which also is the central aspect in an innovation system (Etzkowitz & Leydesdorff 1998). The main purpose of the model is to create a well-functioned collaboration between the actors involved within it. According to Schot and

Steinmueller (2016), an important component to the triple-helix model is that universities and academia in general should become more entrepreneurial.

When it comes to the actors of the second frame of innovation, it is stated that, as previously mentioned, the framing moves away from the linear flow of science to applied R&D to commercialization. Instead, knowledge is generated through interaction among more diverse actors in different information systems, which can be national, sectorial as well as regional (Schot & Steinmueller, 2016). Furthermore, it is stated that these interactions involve processes of interactive learning and the building of capabilities to absorb and adapt knowledge (Schot & Steinmueller 2016). In order for such processes to be effective it is of importance that there is an alignment of objectives, goals, as well as capacities of the actors (Schot & Steinmueller 2016).

2.2.3 The Third Frame of Innovation: Innovation Policy 3.0

In today's society and environment, several unsustainable trajectories have created grand societal challenges within fields such as energy, mobility, or healthcare (Alkemade et al. 2011). Many scholars have argued that socio-technical transitions are necessary in order to tackle such grand societal challenges (Alkemade et al. 2011). Furthermore, many scholars have also argued that, due to the importance of innovations in sustainable transitions, all innovation policy should be rooted into transition policy, which is the effort to guide or facilitate sustainability transitions (Alkemade et al. 2011). This is where the third frame for innovation policy comes in.

The third frame for innovation policy, which is still in the process of emerging fully, concerns transformative change. This means that it takes a starting point in the fact that negative externalities of innovation can outweigh the positive contributions of that innovation (Schot 2017). In that sense, innovation policy 3.0 is more focused on tackling the major societal challenges, such as unemployment and climate change. As such, this framing is related to initiatives such as the EU's project to address a number of societal challenges – Horizon 2020. Furthermore, according to Schot and Steinmueller (2016), it is clear that the innovation policy for transformative change, i.e. the third frame of innovation policy, needs to focus much less on the products, processes, R&D, and the firms, but rather on the success of systems wide transformations. In that sense, and according to Steward (2012), transformative innovation must avoid the risk of slipping into a narrative of a goal rather than the specific

routes toward it. Instead, Steward (2012) argues, it needs a range of policy approaches that is able to express its societal nature.

Related to the third frame of innovation policy are the findings regarding the broader implications for mission-oriented investments of (Mazzucato 2015; 2016). She states that it is not just about fixing market or system failure, but that is more important to actively shape and create markets. Mazzucato (2015; 2016) further examines the public organizations ability to steer the direction of innovation, evaluate dynamic change, and to welcome trial-and-error in evolutionary process of innovation. She states that for this to be possible it is necessary that new forms of partnerships being formed between the public sector, the private sector, and academia. These partnerships need to be symbiotic and able to tackle challenges together, and share rewards as well as risks (Mazzucato 2015; 2016).

Whereas innovation policy 1.0 and 2.0 have been directed towards improving the generic capacity of countries, regions and/or industries for innovation and ultimately, economic growth, innovation policy 3.0 is closely linked to the setting of collective priorities (Steward 2012). One important building block of the theoretical framework relates thus to the conditions and mechanisms through which directionality is provided (Steward 2012). Furthermore, to process of providing new directions for socio-technical systems change also include processes of opening up a wide range of choices before eventually closing down the options to be pursued (Schot & Steinmueller 2016). In that sense, transformative innovation policy must be open to adaptability, reversibility, learning, and not turning too quickly to “for” or “against” arguments regarding specific options. This openness should result in experimentation. (Schot & Steinmueller 2016)

Several elements, such as skills, regulations and policies, user preferences, as well as cultural factors are understood to co-evolve in socio-technical systems and the third framing of innovation policy (Schot & Steinmueller 2016). However, in the underlying model of the third frame of innovation policy there is no “best-practice” to sustainability, the reduction of unemployment, or any other socially desirable goal. Instead, the process involves actors negotiating alternative pathways, which all have the potential to set a new trajectory for the system (Stirling 2009). As such, the model needs to be experimental, as no pathway is known beforehand. Therefore, it is only through the experience of interacting with a variety of actors, all with different motivations and priorities, that a pathway, which fits with the overall

purpose, can be identified (Schot & Steinmueller 2016). With this in mind it becomes of interest to mention that the third innovation policy framing should focus on innovation as a search process, guided by social and environmental objectives (Schot & Steinmueller 2016). This notion is supported by Steward (2012) who argues that knowledge is required for a transformative system innovation in order to be more integrated and practice based, compared to conventional academic science. In that sense, knowledge is acquired through a 'learning-by-doing-approach', and innovative experimentation. Furthermore, the framing should be successful if the innovation process is inclusive, experimental, and aimed at changing the direction of socio-technical systems. In this sense, framing three differentiates itself from the first frame of innovation, which is more focused on R&D investments. Furthermore, this is also different from the focus of the second frame of innovation, which is directed at boosting the absorptive and learning capacity of the system of innovation by constructing networks of knowledge (Schot & Steinmueller 2016).

Table 2.1: Summarization of Innovation Frame 1.0, 2.0, & 3.0

Innovation Frame 1.0	Innovation Frame 2.0	Innovation Frame 3.0
<ul style="list-style-type: none"> • Prioritizes the discovery of an invention, rather than the application. • Academia and researcher discover and public and private sectors commercializes the invention. • Linear approach. The division of labor and responsibility is clearly divided. • Innovation for growth - economic growth is the main focus. • Create incentives for the market to produce desired levels of science knowledge, i.e. R&D. • Knowledge sharing has suffered. 	<ul style="list-style-type: none"> • Bigger focus on the application and the commercialization of the invention. • Knowledge production. • Knowledge is tacit and requires contexts. • Prior experience on the field is needed to be able to absorb knowledge. • Moves away from the linear approach towards a more interactive model. • Knowledge networks, such as the triple helix model. • Knowledge is generated through interaction among diverse actors in different information systems. • Alignment of goals and objectives in the collaboration more important. • Focus is also mainly on economic growth. 	<ul style="list-style-type: none"> • Acknowledges the negative externalities of economic growth, which leads to a greater focus on societal challenges. • Success of system wide transformation. • Mission-oriented investments. • Shape & create markets. • Trial and error – evolutionary approach towards innovation = experimental innovation process. • New partnership is formed between academia, public- and private sector. • Collaborations share goals, rewards and risk, i.e. collective priorities. • Open to adaptability, reversibility, learning, and open to options. • Factors like skills, regulations, policies and culture should co-evolve. • No best practice of sustainability – new pathways through new set ups of actors.

Source: Own Constructed from Schot & Steinmueller (2016); Stirling 2009; Mazzucato (2015; 2016); Cohen & Levinthal (1989); Schot 2017

2.2.3.1 Main Categories that is Important in Policies for a Transformative Change

Based on the literature on innovation policies for moving towards a sustainable transformative change, important overarching categories can be identified. All these categories together could in that sense lead us closer to a transformative change with a systematic approach, which further means that policies needs to focus much less on the products, processes, R&D, and the firms. Moreover, the policies need to focus on transformative solutions that tackle social challenges, be systematic by including different actors with shared priorities, as well as adapt to an experimental and evolutionary approach in the development of innovation.

Focus on societal challenges & mission-oriented investments: Takes a starting point in the fact that negative externalities of innovation can outweigh the positive contributions of that innovation. Therefore, more focus on tackling major societal challenges, such as unemployment and climate change. Furthermore, innovation policy for transformative change needs to focus much less on the products, processes, R&D, and the firms, but rather on the success of systems wide transformations. In that sense, the third frame of innovation policy is able to shape as well create markets, which means that investments are mission-oriented. (Schot & Steinmueller 2016)

New Collaboration, set ups, and shared priorities: New forms of partnerships being formed between the public sector, the private sector, and academia. These partnerships need to be symbiotic and able to tackle challenges together, and share rewards as well as risks, and in that sense, moves towards a more non-linear approach. This is only possible if the goals of the different actors are aligned, which is possible if factors such as skills, regulations, policies, and culture are able to co-evolve. (Schot & Steinmueller 2016)

Experimental and evolutionary approach: The model needs to be experimental, as no pathway is known beforehand. This should be developed through a negotiation between different actors on which way to go. Furthermore, transformative innovation policy must be open to adaptability, reversibility, learning, and not turning too quickly to “for” or “against” arguments regarding specific options. In short, there is no best practice and there is a need for experimenting with different options as well as different actors. (Schot & Steinmueller 2016)

We have seen that these aspects are the most important or at least believed to be important for these types of policies. Based on these main important categories we will now evaluate how the innovation programs have addressed these categories that is important in order to promote innovation for a transformative change in the society.

3. Methodology & Data

In this chapter the methodology and data used in this study is presented and discussed. Firstly, the research approach and the methodology in general are presented. Secondly, the limitations of the research methodology are stated, discussing the reliability, validity, and the generalizability of the research. Finally, the data collected and analyzed in this study is described.

3.1 Method

The aim of this study is to evaluate the effect of innovation policies for a sustainable transformative change. In order to check whether the present Swedish innovation policies address this, two innovation programs managed by the Swedish governmental agency Vinnova have been chosen. Vinnova is an authority under the Ministry of Enterprise and Innovation and have a mission to promote sustainable growth through funding of needs-driven research and through the development of conditions for innovation (Government Offices of Sweden 2015). Vinnova promotes innovation, for instance, through collaborations between different actors on the market, such as companies, universities, research institutes and the public sector. In order to reach out to actors, Vinnova manages funding through specific programs that aim to target important strategic areas for Sweden's innovativeness (Vinnova 2016a). The two of Vinnova's innovation programs that were chosen as the cases for this study was the program for Challenge Driven Innovation and the Strategic Innovation Program. These programs were chosen since their aim is to target societal challenges with a more systematic and transformative approach towards innovation. The systematic view means that the vision of the program is to promote collective actions between different actors on the market with a mission oriented investment. These programs will be described with more detailed information regarding their construction and purpose in the following chapter.

This study will not test any specific hypotheses, but this will attempt to contribute with insights into the reality of policy realization in regards to innovation concerning societal challenges. The study will embrace a qualitative method with an exploratory research design. An exploratory research design is useful when the problem and the field still have not been clarified or fully established, it also offer an adaptable and flexible approach towards new facts (Saunders et al. 2009). Exploratory research makes it possible to narrow down a

complex but relevant issue as the research continuously digs deeper into its topic without excluding facts and details that can be relevant for the study. In order to conduct material for an exploratory research, one can use a literature review, subject interviews or focus groups (Bryman 2011). This study will apply a theoretical literature framework as well as conducting interviews, which have been based on the theoretical framework in order to obtain a deeper understanding of the investigated issue.

The choice of a qualitative method is justified by the fact that the study is searching for descriptive answers in how the selected enterprises experienced the overall effect of the innovation policy instrument, more specifically the innovation programs. A qualitative study allows making further analysis of the response and a development of reasoning can be made (Jacobsen 2002). The aim of this method is thus to gain a deeper and a more descriptive view of a complex reality (Easterby-Smith et al. 2008; Jankowicz 2005; Saunders et al. 2009).

In total, six semi-structured interviews were conducted during 2017, where four of these were with SMEs that had been involved in two of Vinnova's innovation programs, Strategic Innovation Program and Challenge Driven Innovation. All SMEs involved in the first round of the program were contacted for an interview but only four of these replied and accepted to be a part of this research. The other two interviews were conducted with the respective responsible program managers from Vinnova. This meant that they had relevant information about the subject, and could in that sense carry out its mandate (See section 3.2 for more detailed information about the interviewees). Semi-structured interviews provide a source of information that possibly could mirror the experience of the representative that is involved in the case (innovation program). The interviews were semi-structured with the purpose to allow both the interviewer and the interviewees to raise issues that might come up during the ongoing discussion. Semi-structured interviews are in that sense very flexible, non-directive question with only an overall structure to rely on (Merriam 2014; Seale 2004). In order to achieve this, the interviews were based on questions that were open-ended (See Appendix 1 & 2).

The sampling strategy targeted representatives from specific projects that was funded within the chosen innovation programs, and where SMEs were listed as the project leader for the project. This could leave out some interesting knowledge and experiences from other actors that were involved with the programs or the same projects as the SMEs. However, in order

to meet the aim of this study it would be enough to investigate the SMEs' view. To only focus on SME was also a way to narrow down the research. Enterprises are by the European Union (2017) defined as SMEs if the staff headcount are lower than 250, if the turnover does not exceed 50 million euros, as well as if the balance sheet that is lower than 43 million euros.

The program managers behind the chosen innovation program at Vinnova were selected with the purpose to obtain their knowledge and perspective on the overall background and aim of the program. The selection of specific programs, projects and interviewees were based on the public information that is published on the webpage of the Swedish Innovation Agency, Vinnova. All the projects, from where the representatives were selected, had past its ending date. This was an important factor since it would make it easier to find possible effects and relevant circumstances around the innovation process if it had ended. The respondents were asked about activities that were related to the Strategic Innovation Program and the program of Challenge Driven Innovation as well as the operational design of the programs. The interviews were performed via telephone, lasted between 30 to 100 minutes and were recorded as well as coded. However, since the interviewees were native Swedish were also the interviews performed in Swedish and then translated to English. The empirical material was then structured and analyzed based on a coding scheme (See Appendix 3). The recorded material was coded in order to find different themes in the interviews, which made it clearer when to analyze and compare the different experience among the included projects (Kvale & Brickman 2009).

The interviews were further complemented by secondary data on the topic of innovation policy and innovation policy instruments that tackle grand societal challenges, statistics of applications and budget for each program, as well as evaluation reports of these programs (performed by Vinnova). Further secondary data that was used is represented by different kinds of academic publications, newspapers, online databases, official online webpages and other relevant published materials, from sources such as the OECD and Vinnova. Secondary data was used in order to validate the interview data as well as deepen the understanding in the different innovation policies' processes and aims.

3.1.1 Limitations and Considered Factors of the Chosen Method

As this research strives for credibility in regards to the chosen methods, as well as the primary

and secondary sources, factors concerning the validity, reliability, generalization of the study, as well as ethical factors, have been taken into consideration.

3.1.1.1 Generalization

Since there is a limited body of research with a similar academic approach as this study, which focus on the experience of SMEs, or with the chosen applied theoretical framework, this study could contribute to the existing body of research on the field. In that sense, this study could become relevant for future research, as the studied field could be expanded. However, it should be noted that this study does not have to reflect the truth on the matter or that it represents the whole population, i.e. all the participating projects in the innovation programs. This since the respondents can share their personal experience, or represent different industries and similar factors that make it difficult to generalize the findings. To further avoid generalization, a scientific approach and a theoretical framework have been adopted in this study (Ekström & Larsson 2010). As the study only view SMEs experiences it is important to be aware of the other actors' experiences, such as universities and research institutes that have been involved in the program and the projects that are left out. There is in that sense not possible to generalize the findings for all the involved actors in the projects, since they might have another experience of the situation.

3.1.1.2 Validity & Reliability

The validity of the data, more specifically whether the data reflect the reality and answers the crucial questions, is always considered as a one of the major limitation when using a qualitative method. The validity of the data used in this study is affected by the accuracy in the selection of what to include in the result and analysis from the collected material. There is always a risk that important aspects in the data are left out. However, by recording and coding the interviews the study's reliability and transparency increase (Silverman 2001). Furthermore, the questionnaire that was used during the interviews is published in the study as an appendix. One way to improve the validity of a qualitative study is to apply triangulation, which means that you add several perspectives of the phenomenon (Wisker 2009). Triangulation was applied on this study by adding several perspective of the studied phenomenon, such as official governmental reports, OECD report, Vinnova's webpage and interviews.

3.1.1.3 Ethical Considerations

The ethical considerations are taken into account in order to improve the validity of the study. There could be a risk of subjectivity as well as limitation of the results when using a qualitative method due to the author's own ability to interpret and collect the data. Furthermore, there is an ethical risk that desired data is chosen to fit a certain narrative or that leading question is asked in order to reach the author's desired result. To minimize the risk of subjectivity in this study the theoretical framework was used when coding the results. The respondents have before publishing the results been able to correct the interpretation that I made out of the interviews. This has limited the researcher's own interpretation on the answers. The interviews will not be published due to respect the respondents and their projects confidentiality and information that were classified as sensitive if it was published.

3.2 Data

The data for this study consists of interviews with SMEs that have taken part of public funding for innovation projects within the two specific programs "Strategic Innovation Program" and "Challenge Driven Innovation". The data does also consist of interviews with responsible program manager for each program at Vinnova.

3.2.1 Description of Sample

3.2.1.1 Challenge Driven Innovation

The enterprises that have taken part of the program Challenge Driven Innovation were chosen among the projects that were included in first round in 2011 of funding within the program. The enterprises included from this program were to their size categorized as SMEs. The details of these projects, such as name of the enterprise and project, will be kept anonymous. The interviewees from this program were the project leader for the projects that had received funding from Vinnova.

Table 3.1: Summarization of two funded SMEs within Challenges Driven Innovation

Project	Size of funding (SEK)	Field of project	Ending year of the project
SME: CDI-A	250 000	Competitive Production	2012
SME: CDI-B	250 000	Sustainable attractive cities	2012

Source: Own Constructed form Interviews

3.2.1.2 Strategic Innovation Program

The enterprises that have taken part of the program Strategic Innovation Program were chosen among the projects on the field of “BioInnovation”. The respondents for this program were the project leader for projects that received funding from Vinnova. The enterprises that were included from this program were to their size categorized as SMEs. The project as well as the project leader will be kept anonymous.

Table 3.2: Summarization of two funded SMEs within Strategic Innovation Program

Project	Size of funding (SEK)	Field of project	Ending year of the project
SME: SIP-X	250 000	BioInnovation	2016
SME: SIP-Y	0 (Project collaborator)	BioInnovation	2016

Source: Own Constructed form Interviews

3.2.1.3 Managers of the Innovation Programs

The respondents that were selected as representatives from Vinnova were the program managers for the two chosen innovation programs. They were chosen with the purpose to share their thoughts, experience and knowledge on the field as well as to meet the perspective and critics from the interviewed enterprises. The program manager for the Strategic Innovation Program was also the responsible manager for the specific program of BioInnovation. Their names will be kept anonymous.

4. Cases – Innovation Programs

In this chapter the two studied innovation programs are described more extensively. The information presented here consists of both secondary data, such as information gathered from Vinnova's website or OECD, as well as the interviews with the two program managers. First the Strategic Innovation Program will be described, followed by a presentation concerning the Challenge Driven Innovation program.

4.1 Challenge Driven Innovation (CDI)

The program, Challenge Driven Innovation - Societal challenges as opportunities for growth, was an initiative taken with the purpose to meet the global societal challenges (Vinnova 2017e). It was launched by the Swedish Innovation Agency (Vinnova) in 2011. The aim of the program was to stimulate actors on the Swedish market to embrace a new system of developing innovation. The program had one main question, which was how to turn the threats of these challenges that the society is facing into opportunities, and through that reaches both social and business benefits. Moreover, Vinnova collaborated with the Swedish business community and the academia in order to identify four fields of societal challenges in which Sweden has good prospects to be at the forefront. These fields of societal challenges are the future health and health care, competitive production, sustainable attractive cities, and the information society 3.0 (Vinnova 2017e).

The applicants were supposed to narrow the challenges down to a specific societal challenge that they wanted to develop innovative solutions within. According to Vinnova (Interviewee 1 2017), Challenge Driven Innovation has turned out to be one of the largest programs at Vinnova with the highest participation rate of SMEs.

It was a couple of central aspects of the Challenge Driven Innovation Program that the applicants were needed to take into consideration when applying for financial support for their projects (Vinnova 2016b). The projects direct or indirect effect on the competition and attractiveness had to be clearly defined. The innovation idea had to be realistic and value creating for the society (Interviewee 1 2017). Another aspect was that the projects' applications should be within one of the four identified filed.

Through cross-border collaboration, the ability to meet the societal challenges increases. Furthermore, the collaboration for innovation between private and public actors does also increase the understanding for the development of policies and strengthens the controlling instruments for solving complex societal challenges. There was in that sense no request in the first round in 2011 that specific actors were supposed to be included in the collaboration for the different projects (Interviewee 1 2017). This meant that it could be collaboration between three actors, where all of them were representatives only from research institutes and vice versa. However, there was one request on the collaboration set ups, which was that the potential end user of the innovation was actively included in the project. Moreover, in collaborations it is important to separate the access to funding and the access to the final results. In regards the results, the involved actors have to negotiate how the distribution of results will look like between the actors involved. It is in that sense important that the involved actor have the same purpose with the final innovation. The second dimension develops solutions that directly or indirectly contribute to an economical, ecological, and sustainable development (Vinnova 2016b). Innovations that contribute to a more sustainable development can in that sense lead to new business opportunities that can decrease the costs for enterprises and public organizations.

Furthermore, the program was divided into a three-steps-process of funding, step A-C (Vinnova 2016b). Step A concerned funding that was supposed to support the development of the idea of a project as well as the constellation of the project. Step B related to funding with the purpose to build on the step A by developing solutions that were missing or undeveloped. Step C involved testing and implementing the developed project. Vinnova was the decision-makers in the selection on which projects to fund in the different steps of the program. The people that were involved in the decision making for the first round of the program in 2011 (the round from where the interviewees were selected) were only internal representatives from Vinnova (Interviewee 1 2017). However, in the decision making for step B and C were also external representatives involved. As a rule, Vinnova usually mixes the decision-making group with both internal and external representatives. Vinnova usually tries to have a variety of background and knowledge as well as a combination between academia and industry among their decision makers. There are also usually a geographical spread and gender equality among the representatives.

The final outcome of all the projects and the overall results of the program are measured through concrete innovations and innovativeness (Vinnova 2016b). This means that the program contributes to new, renewable or strategic collaboration and networks. This means further that the financed projects could involve or improve other organizations and actors, which are both public and private. Furthermore, the success of the program have been confirmed by the fact that they have presented the new concept of the program for the European Commission, i.e. the concept of a bottom up perspective, step-by-step financing, and relying on the players. The first round of the funding reached out to the actors as early as in the year of 2011, which means that some of the projects that received funding have reached their goal. However, innovation has to be seen as a long-term process, which can create difficulties when measuring the effect of these types of innovation programs. The projects that got funding in all of the steps, A to C, are involved with the program for about 5,5 years, which illustrates the long-term process that these types of innovation policies comprise. However, Vinnova's manager for this program believes that the overall effect of the innovation program have been successful.

4.2 Strategic Innovation Program (SIP)

The Strategic Innovation Program belongs to an area of initiatives for strategic innovation. The initiative has been divided into two different phases. The first phase of the initiatives concerning strategic innovations is called Strategic Innovation Agendas (OECD 2016). The Strategic Innovation Agenda covers the description of the vision, goals, as well as strategies for the development within a certain field. This agenda is developed together with different actors within this field of development and are supposed to function as a guiding manual in the process of renewable and development of an innovation field in order to foster for growth in Sweden. However, it was not a requirement to have a Strategic Innovation Agenda to be able to apply for the second phase of the area of initiatives for strategic innovation.

The second phase of the initiative is the actual Strategic Innovation Programs. In this phase the initiatives get support for the implementation of research or an innovation. The first Strategic Innovation Programs were launched in 2013. The programs were launched by the Swedish Innovation Agency (also known as Vinnova), the Swedish Energy Agency, and the Swedish Research Council for Environment, Agricultural Science and Spatial Planning

Vinnova (2017). The overall purpose of the strategic innovation programs is to create sustainable solutions to global society challenges, strengthen the Swedish business community, and to increase international competitiveness (OECD 2016; Interviewee 2 2017).

Another purpose of the Strategic Innovation Program was to collect actors within the same field of expertise but from different areas in the society and together tackle societal challenges (Interviewee 2 2017). This interaction between different actors (government, researchers and businesses) is very important and valued highly by the program. Within the program companies, academics, and organizations are together able to develop future sustainable products and services. An important factor in the interaction between the various actors is that the different collaborations are agreed on the results and the goals. Continuously, enterprises want to commercialize while researchers want to produce, i.e. enterprises want to share their results versus the researchers who wants keep the results for themselves. These conditions may exist and therefore it is very important that the goals are collected before you enter a project together with actors from different fields. The incitements need to be honest and right from all the collaborators.

The programs further aimed to contribute with competence to the participating enterprises, for instance with new business models and new skilled employees (Interviewee 2 2017). This would in turn generate profit for the enterprises if they offer their time and take part in the projects as the end user of the innovation. However, enterprises have to contribute if they believe in an innovation, because the innovation will in the end be aimed for them. This meant more specifically that the sub programs are user need driven, which means more specifically that it is the actors that put together the sub program and set the strategic outline and goals. In the end, it is important that it is the user need driven actors who control the innovation process and not that the process becomes a fundamental research. If companies do not see the value of spending time in an innovation project, then the question can be asked if there are no final benefits of the innovation project. The program manager concludes that an innovation process is not sufficiently good enough if enterprises are not willing to contribute.

Vinnova also had an evaluative role in order to see whether the goals were followed. If the programs do not follow their goals, the program is not receiving further funding. The financial funding is an incremental process with a budget of approximately 25-55 million a₂₆

year. Through announcements these programs give out grants to innovative projects in different areas. It was each programs own responsibility to distribute the funding to different projects within the program and within the requirements that Vinnova had set up. The programs are evaluated every three years. In the autumn of 2016, Vinnova had their first and concise results of the first three years. The program manager argues that it overall has been a successful effort, however it is difficult to draw any conclusions on the long-term effect of the program.

The applicants had to describe their area and why these were important to Sweden and the sustainable development. This resulted in 17 different sub programs, within the Strategic Innovation Program, that were unique to their area of expertise. One of these sub programs was BioInnovation.

4.2.1 BioInnovation

This study focuses on the Strategic Innovation Program that target global challenges for sustainability and in particular on the sub program BioInnovation. The BioInnovation program has its foundation in the vision that Sweden should make the transition towards an economy that relies on bio-based material by the first half of 21st century (BioInnovation 2017b). The aim of the program is in that sense to develop innovations that will make the transition easier, such as bio-based material, services and products. The ambition is to promote the interaction of experiences, knowledge and competence among the different actors within business sector, public sector and universities. The prioritized fields for bio-based innovation have been chemicals and energy; construction and design; materials and new utilization. Except for the challenge to make the transition towards a bio-based economy but also challenges to implement new production processes and to satisfy the consumer's preferences as well as the market itself. It also specifies that the natural resources that are in need of being used in a more efficient way.

5. The Experience of the Innovation Programs' Participants

In this chapter the results, in the form of the experience of the innovation program participants, are presented. These empirical results consist of the empirics provided by the four interviews with the project leaders. More specifically, this chapter consists of a presentation of the empirics concerning the projects related to the Challenge Driven Innovation program, followed by empirics concerning the projects related to the Strategic Innovation Program. These results will be presented in relation to the three major categories related to the third frame of innovation policy, which were identified previously in this thesis; societal challenges and mission-oriented investments, new collaboration set-ups and shared priorities, experimental and evolutionary approach.

5.1 The Experiences of Challenge Driven Innovation

Focus on societal challenges & Mission-Oriented Investments

Project *CDI-A* was a project within social sustainability and were in particular chosen for the field of competitive production, which was one of the four main fields for the program Challenge Driven Innovation. The project *CDI-A* targeted final users within the business- and public sector where the final innovation aimed to be applicable in diverse business models in order to achieve competitive advantages and growth by improving the management model. However, the main aim of project *CDI-A* was to increase the social sustainability within businesses. Furthermore, the concept of sustainable development is vague and broad, which makes the improvements on the field complex. The project leader believes that, when the majority thinks about sustainability and societal challenges, it is usually the environmental aspect that gets the most attention. The project leader experienced that many of our major challenges ends up in the shadow of these types of innovation program, because of a lack of knowledge. Especially the social sustainable development is not taken into consideration to the same extent as environmental and economic challenges.

Project *CDI-A* received funding in the first step, step A. More specifically, this meant six months project planning, which included networking, planning the time line, allocating resources, and finding end users as well as stakeholders. This was further used as the application for the following step B, where Vinnova rejected them. The project leader's

experience for project *CDI-A* and the program of Challenge Driven Innovation was not of satisfaction, which was due to the programs lack of support and effect for the projects future development. The funding resulted in a foundation of the innovation process, which more specifically was the project plan they worked on in step A. However, their final innovation that they applied to get funding for in the first place was developed mostly without funding from Vinnova. Vinnova's explanation for rejecting further funding was due to a lack of commercial value in the final innovation. This decision was something that the project leader interpreted and experienced as due to a lack of knowledge and relevant business competence among the decision-making administrators at Vinnova.

Project *CDI-B* was funded in the field of sustainable cities, which was one of the challenges addressed by the program. The project was targeting problems that concerned environmental sustainability with an innovation that was aimed to offer optimizing solutions for the citizens' everyday lives.

Project *CDI-B* was, as project *CDI-A*, only funded in step A of the innovation program. The enterprise behind project *CDI-B* applied for further funding in step B, but Vinnova rejected them. The project leader experienced that the assessment was quite strange, in particular the assessment of which actors that received funding. They believed and experienced that the majority of the actors that received funding for step B, if you exclude all the research institutes and universities, were large enterprises. It was further argued that it was misdirected funding due to the fact that large companies have their own resources for innovation. Furthermore, the project leader believes that large enterprises have a slow innovation process comparable to SMEs, and that SMEs in general are more innovative. The financing does not get the same exchange rate in large companies comparable to small companies in that sense, which should be taken into consideration in the decision process. The enterprise was overall satisfied with the funding since it was a large amount of financial support for them as a small enterprise in an early phase of the innovation process. However, the enterprise experienced it as a defeat to not receive the millions of funding that they missed out of in step B and C.

The project leader for project *CDI-B* argued that since the aim of the program of Challenge Driven Innovation was to develop innovations that were system-oriented, it was strange that only universities and research institutes were eligible for funding in step C. This was further supported with the project leaders argument that researchers are behind in their way of

developing innovation, since they have more of a following-up approach. According to the project leader of CDI-B, SMEs are in comparison more challenging in their way of innovating, which creates new paths.

New Collaboration Set-ups and Shared Priorities

The enterprise behind project *CDI-A* were involved in a collaboration with other actors from the business sector as well as actors from research institutes and academia. The actors from the business sector were included as the stakeholders and the end user of the innovation. Regarding the collaboration with other actors within this program, the project leader experienced that a stronger bridge is needed between research institute, universities and the business sector. The project leader referred to the problem as the “death valley” of knowledge between these actors. Research institutes receives a lot of funding, but the problem is that their link with other actors within a triple helix model is weak, which hinders the innovation process to be efficient from a commercial perspective.

Despite the fact that the enterprise behind project *CDI-B* did not receive funding for step B and C, they still saw a value in the possibilities (such as new collaboration set-ups) that step A had generated for the project. The enterprise collaborated with research institutes and universities in their innovation project, where the enterprise itself was the actor who instituted the cooperation. The project leader for project *CDI-B* believed that research institutes and universities do not know how to take initiatives for cooperation with enterprises, even though it is believed that they wish to collaborate with other actors. The enterprise also believed that the collaboration suffered since different actors have different approaches and priorities towards innovation. The project leader believes that academia and researchers tend to adapt a “following-up” approach while enterprises are more innovative in their working process. This is something the project leader believes is reflected in the collaboration when academia and researchers have the lead in a project.

Another problem that have been experienced, by the enterprise behind project *CDI-B*, is that small businesses owners, like them, cannot afford to sacrifice the time that is required for collaboration with research institutes and universities if they, as an enterprise, do not get any financial support for it.

Experimental and evolutionary approach

The project leader for *CDI-A* got the experience that the whole program was an experiment performed by Vinnova. This was something Vinnova declared and shared with the participant of Challenge Driven Innovation program. In addition, the project leader for *CDI-B* experienced different approaches towards the development of innovation. These differences are expressed with a more following-up approach among researchers and academia while enterprises are more evolutionary and innovative in their development.

Table 5.1: Challenge Driven Innovation – All funded programs in 2011/2012

Number of applicants	The total amount of financial support for the whole program (SEK)	Number of projects funded in step A (2011) (Up to 750 000 SEK)	Number of projects funded in step B (2012) (Up to 10 million SEK)	Number of projects funded in step C (Up to 5-20 million SEK)
635	Approx. 250 millions	96	21 (2 actors from the business sector, 19 actors from research institutes and academia)	8 (8 actors from research institutes and academia)

Source: Own Constructed from Vinnova (2012; 2017a; 2017b)

5.2 The Experiences of the Strategic Innovation Program

Focus on societal challenges & Mission-Oriented Investments

Project SIP-X got funding within the field of BioInnovation, which was the sub program to the main Strategic Innovation Program. The innovation project aimed to develop textile products produced by natural resources. Project SIP-Y were also within BioInnovation and concerned the development of a service in order to recycle textile products produced by biomaterial. The financial funding from Vinnova was only received by the enterprise that also had the main responsible for project SIP-X. The amount of money that the enterprise received was a smaller amount but the project leader argues that it was a lot for a SME in the early stage of launching a new product to the market. The project leader experienced that it was an important component in the launching process and for the development of the innovation project as a whole. The product is commercialized and has been a success in the

sense that the enterprise experience that customers demand products that is produced with natural resources.

The enterprise behind project *SIP-Y* was the responsible project leader of the innovation process. However, they did not get access to any direct financial support from Vinnova for project *SIP-Y*. The receiver of the financial support was instead one of the research institutes that were included in the collaboration, i.e. the innovation system for this innovation project. Project *SIP-Y* differs in that sense from project *SIP-X*, since project *SIP-X* was the actual receiver of the financial support from Vinnova. The enterprise experienced the sub program of BioInnovation as extremely inefficient, difficult to interpret and that it was a slow process for the actors that did not directly take part of the financial support.

New Collaboration, set ups, and shared priorities

In project *SIP-X* the enterprise collaborated with one other actor, a university. They experienced that it was a smooth collaboration were the university contributed without taking part of the financial support for the project. The enterprise valued the work that the university contributed with, since they had expertise knowledge that was valuable for the further development of their innovation project.

The enterprise behind project *SIP-X* has since the start of BioInnovation got several requests from actors within the program regarding new collaboration set-ups for new innovation projects. This means that they are still involved with the program and get requests even if the actual funding for their project has past and they have launched their product. The project leader for *SIP-X* acknowledged in the interview that all the actors within the Strategic Innovation Program and, more specifically, all the actors within the sub program of BioInnovation still have an ongoing interaction with each other. However, the enterprise has rejected offers they have gotten for collaboration with research institutes and universities in projects where these actors have been the main receiver of the financial funding from Vinnova. The project leader explains that the reason behind these rejections have mostly been due to a lack of time to offer for projects where they do not get financial support for it. However, this is a situation that the enterprise explains as something that they wished were different. It is believed by the project leader that the field is very interesting and important for a sustainable development and that it would generate improvements for them as a company in the long run.

The enterprise behind project *SIP-Y* is, as the enterprise behind *SIP-X*, still involved in the program, since it has continued to function as a network for actors that want to take part of and develop BioInnovation. This means that the enterprise have access to the network that the program offers, which they have seen as valuable for the company. Moreover, the enterprise entered this program three years ago and was selected as the project leader and co-applicant for project *SIP-Y*, which more specifically meant that the researchers got the financial support and they as a company were involved as the enterprise that were in need for the innovation. Many of the actors that were included in the project, as the actor in need of the innovation, have dropped out from the project as the process has proceeded. This have been due to the fact that it is extremely time consuming for the included actors, especially if you can not take part of the financial support. The project leader argues that for a small company, the time you devote is worth a lot of money. Even though they want to be more involved there are some difficulties in how to make it financial valuable for them. It is also believed that the project is more of a cost for the company rather than a financial benefit.

The enterprise experiences that they have not been involved in the process to the same extent that they wished to be. The experience is that research institutes and universities want to collaborate in theory but are too driven of achieving successful results. This is something that the project leader refers to again as a problem, that research institutes prefers successful results rather than innovation. The project leader summarizes it by saying that the co-operation looks very different depending on who is the one that gets the funding.

Experimental and evolutionary approach

The project leader behind project *SIP-Y* argues that these types of innovation programs open up opportunities for testing hypothesis that can open up for renewable solutions for the society to target grand societal challenges. The project leader further argues that innovations are all about daring to test what have not been tested before and wait for the reaction on the market. Furthermore, you have to be able to take risk in order to test hypothesis. This is a characteristic that is argued, by the project leader, that research institutes and universities do not possess. This is something that the project leader believes depends on the fact that they rather present successful results than an increased level of innovation, this is further believed as a general error when it comes to public funding for innovation.

Table 5.2: Strategic Innovation Program – BioInnovation 2013

Number of applicants	The total amount of financial support for the program (SEK)	Number of projects funded
64	50 millions (3-5 years budget)	23

Source: Own Constructed from BioInnovation (2015; 2017a; 2017b); (Skogsindustrierna 2016)

6. Analysis

In this chapter, the theoretical perspectives, the secondary data, and the empirical findings of this study will be compared to each other. First of all, the aims and the setup of the previously presented innovation programs will be analyzed from the innovation frame perspective. Secondly, the effects and the performance of the programs in practice will be evaluated, using the same innovation frame perspective. This will be done by comparing the empirical results related to the specific programs in each program to the innovation frame perspective. Finally, from an innovation frame perspective, the aims and setup of the programs will be discussed in relation to the perceived effects and performance practices stemming from the projects.

6.1 The Aims of the Innovation Programs – From an Innovation Frame Perspective

In the upcoming section the aims and the setup of the two innovation programs will be analyzed and discussed from an Innovation Frame Perspective. First, the CDI program will be discussed, followed by the SIP program.

6.1.1 Challenge Driven Innovation

The overall aim of this program was to focus on challenge driven innovation in order to meet societal challenges, and through this create opportunities for growth. Considering the innovation frame perspective, this is in line with the focus of policies that want to contribute to a transformative change (Schot & Steinmueller 2016; Alkemade et al. 2011). However, it is of course arguable whether the four fields of societal challenges in Sweden, such as competitive production, are one of the major societal challenges comparable to the major challenge of climate change. In addition, the applicants were also supposed to narrow their respective projects down to a specific challenge that they wanted to meet within one of the four identified fields. This could both indicate that the program was mission-oriented with this steer direction of the investments for innovation as well as a more experimental and evolutionary approach towards the problem (Mazzucato 2015; 2016). Furthermore, the fact that the applicants were asked to narrow specify their project focus on one societal challenge also mirrors a steered openness towards the potential innovation, which also is a product of the experimentation process (Schot & Steinmueller 2016).

One additional aim of the program, which also could be related to the third frame of innovation policy, as well as the experimental and evolutionary approach, was to stimulate actors on the Swedish market to embrace a new system in how to develop innovation. This was partly related to the three-step-process of funding that the program offered, from the development process in step A, towards the implementing in step C. The amount of projects that got funding in step B was approximately only 1/5 out of the project in step A. It is in that sense arguable that the 4/5 of the projects in step A that did not receive further funding in step B could be classified as a projects that went through a phase of trial and error. Moreover, since Vinnova accepted 96 projects for step A, indicates that they were opening up a wide range of choices before closing many of them in step B (Schot & Steinmueller 2016). Furthermore, it also indicates that the program as a whole was an experiment per se, since this way of giving out funding in different steps of the innovation was new to the market and for Vinnova.

The program further aimed to contribute to new arrangements of collaborations and networks. The program emphasizes the importance of collaboration between actors but do not request that specific different actors from different field should collaborate. This is in line with one of the factors that need to be considered for a policy that want to meet a transformative change to some extent (Schot 2017; Schot and Steinmueller 2016). However, it also goes against certain elements related to transformative change to a certain extent. For instance, it is not aligned with the third frame of innovation policy, since there were to request that the collaboration needed to involve different actors, such as academia, public- and private sector (Mazzucato 2015; 2016). However, Vinnova had one request for the applicant concerning the collaboration, which was that the potential end user of the innovation was actively included in the project. Moreover, the involved actors in the collaboration were also required to agree on the purpose with final innovation, which mirrors the collective priorities of goal, risk and rewards that we find in the third frame of innovation policy.

Furthermore, in an interview, Vinnova also mentioned that this program has turned out to be one of the programs at Vinnova with the highest participation rate of small businesses (Interviewee 1 2017). The focus on SMEs and entrepreneurship in innovation policies is a factor that we find in the second frame of innovation policy. This could imply that Vinnova

has an underlying background or aim with the program that was not decided to go public with in the application- or program description.

There are still some factors from the third frame of innovation policy that are difficult to interpret and apply to the case of Challenge Driven Innovation, such as to what extent skills, user preferences and cultural co-evolve with each other (Schot & Steinmueller 2016). Nevertheless, the overall aim and specification of the Challenge Driven Innovation indicates, to a certain extent, that Vinnova has attempted to strive towards a more systematic approach, based on the factors such as collaboration requirements, experimental approach and focus on societal challenges, which in extension means that the program more or less is aligned with the third frame of innovation policy. To the very least, the aim of the program appears to be to be in line with the systematic approach and the third frame of innovation policy.

6.1.2 Strategic Innovation Program

The focus of the Strategic Innovation Program is relatively similar to the Challenge Driven Innovation program, meaning that it aims to create solutions for societal challenges, strengthen the Swedish business community and to increase international competitiveness. This aim of the program, which indeed appears to acknowledge the negative externalities of economic growth in terms of sustainability, is therefore in line with the conditions for the third frame of innovation policy. Furthermore, the more narrow focus in form of BioInnovation and the transition towards a bio-based society could indicate an attempt by Vinnova to steer the direction of innovation and promote the evolutionary approach of innovation development. The sub program of BioInnovation also focus on new production processes and to meet the consumers and the markets preferences, which implies that the sub program shapes and creates market, and in in that sense in line with the third frame of innovation policy (Mazzucato 2015; 2016). Moreover, the program also emphasizes the support it offers in the implementation on the innovation, which is a distinction from first frame of innovation policy where more focus is on the invention itself rather than application of it (Schot & Steinmueller (2016).

The third frame of innovation policy emphasizes the importance of the systematic approach i.e. collaborations and partnerships between the public sector, the private sector, and academia. This is something that is indeed present in the Strategic Innovation program. It is also addressed as something very important to the success of the program. Furthermore,

another important factor in the interaction between the various actors is that the different collaborations should agree on the results and the overall goals in order to tackle the specific challenge in question. In other words, the alignment of goals and a symbiotic partnership approach appears to be crucial for the success of the program. This indicates that the program applies a non-linear approach, which in extension means that it distinguishes itself from the first frame of innovation policy (Schot & Steinmueller 2016). Furthermore, the incitements need to be honest and right from all the collaborators, which is in line with the notion of shared risk and reward for a transformative change (Mazzucato 2015; 2016). Moreover, Vinnova also mentioned that they do not give out further funding if the goals are not followed, which strengthens the importance of a strong partnership and goal alignment. In short, the Strategic Innovation program appears to be strongly aligned with the notion of applying new collaborations, set ups, and shared priorities in order to achieve a more holistic systematic transformative change in order to tackle grand societal challenges. This would of course be very much in line with the ideas of the third frame of innovation policy.

6.2 SMEs Experiences (CDI) - From an Innovation Frame Perspective

In this section, the projects related to the CDI program will be discussed. As mentioned, in this section, the effects and the performance of the program in practice will be evaluated considering the innovation frame perspective. The perceived results and effects will further evaluate based on experiences that the program participants and that the projects might have. Furthermore, this will be done by, in relation to the empirical findings, discussing the three major categories related to the third frame of innovation policy, which were identified previously in this thesis; *societal challenges and mission-oriented investments, new collaboration set-ups and shared priorities, experimental and evolutionary approach*.

Focus on societal challenges & Mission-Oriented Investments

Both projects CDI-A and CDI-B have had a focus on societal challenges within the field of sustainable attractive cities as well as competitive production. These are fields that can be considered to be more or less grand societal challenges addressed by the program. The focuses concerning these two projects are in that sense in line with the third frame of innovation policy, where the focus should be to tackle societal challenges for a transformative change (Schot & Steinmueller 2016). Furthermore, both projects were also in line with the

third frame of innovation policy, since they can be argued to be considered as mission-oriented investment innovations. The innovations could be mission-oriented investments from Vinnova's perspective in the way they wanted to improve the markets, and in that sense shape them in order to move towards a transformative change in the specific market that these innovations and project aimed to target.

As previously mentioned, project CDI-A was rejected further funding in the three-step process of the program. According to Vinnova this was due to a lack of commercial value in the final innovation. This could indicate that the program had a deeper focus on the product than the actual challenge that the innovation aimed to tackle. The decision-making regarding this project is in that sense more in line with the approach related to the second frame of innovation policy, which focuses more heavily on economic growth and the commercialization of the innovation (Schot & Steinmueller 2016). This opens up for an interesting discussion regarding the trade-off between the relative importance of tackling societal challenges compared to the relative importance of commerciality. Questions regarding thresholds and what are acceptable levels of commerciality as well as focus on societal challenges are here left unanswered. Furthermore, it can be argued that this is true for both the specific CDI program as well as for the third frame of innovation in general to some extent. Moreover, and as mentioned, the project manager for project CDI-A does argue that the project actually had commercial value but that the program manager and Vinnova failed to recognize this. Once again, this opens up for interesting discussion regarding the evaluation of commerciality. However, on the other hand, the rejection of funding could also be due to the CDI program applying an experimentation and exploratory approach, which then would be in accordance with the third frame of innovation policy. As discussed previously, this does indeed seem to be the case. Furthermore, this notion will be more thoroughly discussed, in regard to the perspective of the specific project, later in this section.

New Collaboration Set-ups and Shared Priorities

The project leader for CDI-A claimed that their project experienced a “death valley” of knowledge and result between the business sector and research institutions as well as universities, meaning that the necessary knowledge transfers and knowledge sharing processes were insufficient. Both of the SMEs that was interviewed from this program, but especially the SME behind project CDI-A, experienced these problems in the collaboration and knowledge sharing between actors. As mentioned, according to the interviewed project³⁹

managers, this was particularly noticeable when research institutes and universities were the main receivers of the funding. Furthermore, since this is highlighted by both of the SMEs interviewed for this program it indicates that it could be some problems of partnership between academia, public and private sector. Considering the innovation frame perspective, it is not improbable that this could in that sense create problems for transformative changes, since the partnership among these different actors are highlighted as important for the third frame of innovation policy (Mazzucato 2015; 2016). The death-valley of knowledge, mentioned by the project leader for CDI-A, could also indicate that there was a problem of collective priorities among the actors and that it was a partnership that did not share goal, rewards and risks (Steward 2012; Mazzucato 2015; 2016). Considering the apparent lack of shared skills, regulations, policies, and culture between academia and the private sector (Schot & Steinmueller 2016), in this case, it can be questioned if the CDI program does in fact adopt a non-linear approach. If not, it would appear as if the program is less aligned with the third frame of innovation policy, based on the information that the empirics of this study presents.

However, despite the experienced problems in the collaboration with academia and research institutes, the SME behind project CDI-B did also experience a great value in integrating future customers into the innovation process, as well as the networking and knowledge sharing with these actors. This is aligned with the third frame of innovation policy, since it advocates different elements that should co-evolve for a transformative change (Schot & Steinmueller 2016). These are, as mentioned, culture, user preference, and skills, which could be interpreted into the factors that project CDI-B mentioned as valuable for their project (networking, integrating future customer & knowledge sharing).

Experimental and evolutionary approach

As mentioned in previous paragraphs, neither Project CDI-A nor CDI-B received further funding in step B. This could be a sign that Vinnova practices experimentation and exploration in the CDI program, which would, as mentioned, be in accordance with the third frame of innovation policy, where they are looking for diverse practices, since there is no “best-practice” of innovation as well as no pathway beforehand (Stirling 2009). In addition, the SME behind project CDI-A were told by Vinnova that the program, and in particular the first round in 2011, were in fact an experiment. In extension, this could mean that Vinnova actively has tried to create experimenting and adapting approach in their innovation policy practices. However, on that same note, since no pathway is known beforehand, and that the

third frame of innovation policy is not about turning too quickly to “for” or “against” arguments regarding specific options, the questions still stands regarding the experimentation approach itself (Schot & Steinmueller 2016). Once again, neither the CDI program, Vinnova nor the third frame of innovation policy in general gives any insight on when it is appropriate to actually start to argue against a specific option. As already touched upon, the project manager for project CDI-A claims that Vinnova gave up on the project too soon. If we were then to believe to project manager of project CDI-A, it would indicate that the program might have turned too quickly to “against” arguments when it came to that specific project and option. In that case, the program would not be in alignment with the third frame of innovation policy. However, as mentioned, this notion is depending on questions regarding the appropriate levels of experimentation.

6.3 SMEs Experiences (SIP) – From an Innovation Frame Perspective

In this section, the projects related to the SIP program will be discussed. Just as in the previous section, the empirical findings will be discussed and analyzed in relation to the three major categories related to the third frame of innovation policy, which were identified previously in this thesis; *societal challenges and mission-oriented investments, new collaboration set-ups and shared priorities, experimental and evolutionary approach.*

Focus on societal challenges and mission-oriented investments

Both project SIP-X and SIP-Y received funding for projects for innovations that were aimed to tackle the challenge of making the transition towards a bio based society. This is in alignment with the approach related to the third frame of innovation policy, where the focus is emphasized to be on tackling challenges that would ease the transformative change (Alkemade et al. 2011; Schot and Steinmueller 2016). Furthermore, the sub program of BioInnovation created mission oriented investments with the purpose to both create and shape the market towards a more bio based way of living, which once again is in line with the focus on societal challenges and mission-oriented investments that is related to the third frame of innovation policy (Mazzucato 2015; 2016).

The SME behind project SIP-Y was satisfied with the end-results of the innovation project, but not satisfied with the process. As mentioned, this was mainly due, from their perspective, a slow-moving process with too much bureaucracy. This was experienced as a problem since the company feared that someone else or another company had the opportunity to beat them to it when it came to commercializing their specific innovation. This indicates that the SME in this case had more focus on the commercial value of the innovation rather than the challenge it aimed to tackle. This way of thinking would then be more aligned with the approach related to the second frame of innovation policy, where the commercialization of the invention is in focus, rather than the approach related to the third frame of innovation policy, where focus should also be on how to successfully move towards a transformative change (Schot and Steinmueller 2016).

New Collaboration, set ups, and shared priorities

As touched upon, the SME, which received the funding for project SIP-X, still has a lot of interaction with the previous participants of the program, mainly in order to reap the benefits related to knowledge sharing and counsel. The SIP-X project had a cooperated partnership with a Swedish university that specifies on textile in particular, which was a match for this specific project. This collaboration is in line with the approach related to the third frame of innovation policy to the extent that it generated a new partnership in order to tackle grand challenges (Mazzucato 2015; 2016). Furthermore, it could be argued that this partnership is of the symbiotic kind, as both parties were able to share benefits of the collaboration. Therefore, it could be argued that the project, and in extension the innovation program as a whole, was able to move towards a somewhat non-linear approach when it came to decision-making, collaboration, and the separation of responsibilities. In addition, as the collaboration appear to be continue, even though the project has ended, it offers opportunities to form new partnership for future innovation programs.

In contrast, the SME behind project SIP-Y experienced certain problems in the collaboration between the different actors within the project and the program. This was described as a problem in the sense that the participating actors were not able to take on risks on the same level. The project leader thinks this is more common in the private sector than within the academia and public sector, since the private sector are, according to the project manager of SIP-Y, too focused towards that the end-result have to be a success, in order to receive additional public funding in future project. This indicates that there was a problem related to

the needed symbiotic aspects of the partnership, since it seems as there was a weak alignment when it came to views on risk, goals and rewards, which would in extension be separated from the approach related to the third frame of innovation policy (Mazzucato 2015; 2016). Moreover, this could also imply that the slow-moving process took away the focus on the commerciality of the innovation. The slow process also led to that actors and participants in the program dropped off, because of the lack of efficiency. It could in that sense been questioned whether this affected the knowledge production in the program. In that case both the second frame of innovation policy as well as the third frame could suffer (Schot & Steinmueller 2016; Mazzucato 2015; 2016). Furthermore, once again, the question regarding the appropriate level of commerciality becomes of interest, and once again it appears as if there is a trade-off between commerciality and other aspects of the innovation process.

Experimental and evolutionary approach:

As mentioned, the SME that was behind SIP-X believes that their innovation project's launching went well because they saw a demand and commercial value on the market for their innovation. This notion is aligned with the third frame of innovation policy, as the users' preferences of the innovation in question appear have been considered (Schot & Steinmueller 2016). However, it could also to some extent be argued as a non-experimental project since they saw the commercial value of the project beforehand. On the other hand, was the project new on the market and were in that sense of the experimental kind (Steward 2012).

As previously presented, the project leader for project SIP-Y argued that these innovation programs, i.e. the innovation programs of Vinnova, were a good opportunity to test and experiment with innovations and products that could help society in the long run. This experience is very much aligned with the experimentation-focus that is related to the third frame of innovation policy (Schot & Steinmueller 2016). As already touched upon, the project leader of SIP-Y believes that SMEs are more innovative and more willing to take risk to test a hypothesis. If the project leader is right regarding this question, it is in that sense more logical to focus on support SMEs in the innovation process. Furthermore, according to the approach related to the third frame of innovation policy, which has been highlighted above as well, there is no best practice and new paths should be created in this innovation frame (Schot & Steinmueller 2016). This means further that you have to put yourself out there and experiment with innovation in order to tackle grand societal challenges.

6.4 General Discussion – Program & Enterprises

In this section, the aims and setup of the programs will be discussed in relation to the perceived effects and performance practices stemming from the participating projects. As has been the case earlier in this analysis chapter, this discussion will be divided into the three main categories relating to the third frame of innovation, identified earlier in this thesis; *focus on societal challenges and mission-oriented investments, new collaborations, set ups and shared priorities, and experimental and evolutionary approach.*

Focus on societal challenges and mission-oriented investments.

First of all, both programs, especially CDI, have a strong focus on sustainability and societal challenges, taking into consideration the negative externalities of economic and societal growth. This is of course very much in accordance with the third frame of innovation policy. It can therefore be argued that both programs appear to strive towards being in line with the third frame of innovation policy. However, as shown and discussed, both from a theoretical point of view as well as an empirical perspective, this might not always be the case, since it appears as if some of the projects participating has had another view of the matter. Furthermore, Schot and Steinmueller (2016) even argue that the three innovation frames actually might overlap in practice, which appears to be case for these two innovation programs as well. Moreover, as discussed previously, questions regarding the appropriate level of focus on the societal challenges in comparison to the level of commerciality is left unanswered, which appears to have created confusion and frustration among some of the project managers.

New Collaboration, set ups, and shared priorities:

As already touched upon, it appears as if there are mixed emotions towards collaborations, new partnerships sharing, and knowledge production in the programs. However, most participants and actors in the programs appear to agree on that, in accordance with the third frame of innovation policy, collective goals and priorities are indeed important (Steward 2012 Mazzucato 2015; 2016). However, some argue that this is not upholding in practice. An overall trend in both programs is that they experience problems when it comes to the collaboration with academia and research institutes, due to these actors' lack of innovativeness, risk acceptance and willingness to share their results. With this in mind, the

non-linear approach, related to the third frame of innovation policy, might be in danger (Mazzucato 2015; 2016).

Furthermore, something that appears to be common for both programs is that they both aim for the innovations and the projects to be developed in line with the final user's need. The innovation is in that sense user need driven, which is in line with the third frame of innovation policy, where user preferences is highlighted as one of the important elements to consider (Schot & Steinmueller 2016).

Concerning CDI, and more specifically according to the project leader of CDI-A, Vinnova's decision makers did not have the sufficient knowledge to understand to commercial value and benefits of the innovation projects. Vinnova (2017a) did only include administrator for the first round of the program that were only internal representatives from Vinnova, which could imply that they did not have the right competence for this type of program in order to take such decisions. This could imply that it is important that the representatives behind the decision-making should have the perspective of a potential end user of the innovation. In extension, this indicates that elements such as user preferences, as emphasized in the third frame of innovation frame policy (Schot & Steinmueller 2016), could be relevant to take into consideration even in Vinnova's decision making process, in order to make progresses towards a transformative change. However, this is just speculations based on the experiences that some of the SMEs had regarding Vinnova's representatives behind the decision-making process.

Experimental and evolutionary approach:

Both innovation programs focuses on tests and experimentation. This is especially true for CDI, with its multi-level-steps funding approach. It could be argued that this approach helps the program to experiment and not put all eggs in one basket, testing several ideas to a certain extent, before moving on the next step of the funding and the program. This is of course very much in line with the third frame of innovation policy (Schot & Steinmueller 2016). In addition, this notion of an experimental approach, is supported by Vinnova (Interviewee 1 2017), who claimed that the Challenge Driven Innovation Program had a new structure in their way of giving out funding, in regard to the step-wise and incremental way of funding the innovations/research. However, as mentioned the appropriate level of experimentation and exploration when it comes to the innovation programs is left unanswered.

7. Conclusions

In this chapter, the thesis will be concluded. First off, the thesis aim and set up are briefly summarized. Secondly, in relation to the research question and the theoretical framework of the thesis, certain conclusive statements are made. Finally, suggestions for further research on the subject are suggested.

7.1 Conclusions

This thesis has primarily aimed to investigate initiatives taken for the transformative and systematic transition towards sustainability in Sweden in the form of innovation programs. In order to do this, two cases were chosen; in particular two of Vinnova's innovations program, in order to be able to evaluate how these programs' purposes were experienced by SMEs. In order to go through with this study a qualitative method has been applied and interviews have been held with SMEs that were involved and received funding from any of these programs. Further secondary data has been public documents concerning the program, statistics of applicants and funding, as well as interviews with program managers at Vinnova. Moreover, a theoretical frameworks and concepts related to innovation policies concerning the transformative and systematic transition towards sustainability have been provided in order to establish a solid theoretical knowledge base.

The first section of this thesis introduced the topic, which included a background to the research gap and explanations to why the focus has been on SMEs and innovation programs. This section was followed by the theoretical background, which describes innovation, sustainable development, innovation policies, as well as innovation policies towards a transition by using the framework of the three innovation frames. Section three described the methodology and data, which mainly comprised of interviews and program specifications that have been used to answer the research question. Section four presented the cases, more specifically the innovation programs from where the interviewees were chosen. Section five presented the empirical results from the interview. Finally, in section six these findings have been analyzed with respect to the theories presented in section two.

The analysis in section six was divided into three different parts; the first one is discussing the aim of the program, based on Vinnova's point of view, in regard to the third frame of

innovation policy, which is the frame of innovation policy concerning a transformative and systematic transition towards sustainability. Furthermore, the second part of the analysis discusses the SMEs experiences in the light of the same theory concerning innovation policy. The third and last part of the analysis discusses to what extent the innovation program have reached their aim in regards to the experiences of the studied SMEs.

The aims presented for each program by Vinnova are aligned with the theoretical approach related to the third frame of innovation policy on how innovation policies are aimed to address societal challenges. More specifically, this relates to the programs' aims to focus on innovations that meet the societal challenges, promote collaboration between actors from different fields and sectors, experimental approach. In that sense, the programs' aims appeared to be in line with the systematic and transformative approach towards innovation as well as with the third frame of innovation policy.

In regard to the thesis's research question, the purposes of the programs are relatively well aligned with the experience that SMEs have had of the programs and of their participation. The SMEs' experiences are not aligned with the transformative and the systematic approach towards innovation to the same extent as the programs' aims are intended to be. However, the SMEs and innovation projects that received funding aimed to tackle societal challenges, which are aligned with the innovation programs aim. Furthermore, the majority of the participants have experienced that the program kept an experimental approach towards innovation, even though it was not only positive experiences from this approach. However, three out of the four interviewees have noted that the biggest problem in these programs is the cooperation with actors belonging to the academia or other institutes. This is something that can be discussed to be important criticism for Vinnova and something that policy makers should include in their future constructions of policy instrument such as innovation program, since the third frame of innovation policy promotes a systematic approach, where collaboration is a crucial factor for innovation.

Conclusively, this study finds that the programs' aims are aligned with the third frame of innovation policy, which advocates a systematic and transformative approach towards sustainability. In addition, the systematic and transformative approach notes that policies should tackle societal challenges, promote collaboration between different actors as well as embrace an experimental approach. The SMEs' experiences of the programs is to a larger

extent aligned with what the programs' aims are, and are in that sense also aligned with the third frame of innovation policy. However, policy makers need to be aware that SMEs experience difficulties in the collaboration between other actors, especially universities and academia in general, which is an important factor in the systematic and transformative approach towards innovation and sustainability.

7.2 Limitation of the Study & Future Research

The focus of this research has been to evaluate how the aims and setup of Vinnova's innovation program, tackling societal challenges, have been experienced by the participating SMEs. Due to the study's broad nature, the researcher limited it to these two cases of funding programs managed by Vinnova. This has limited the study to only focusing on these specific policy instruments. The study was also limited by only focusing on the SMEs' experiences of the programs. Considering these limitations, it becomes apparent that there are some noteworthy areas that could be subject for future research.

First of all, since the study only focuses on SMEs and their experience of these innovation programs, the validity, more specifically the generalizability, of the study suffer to a certain extent. Therefore, one possible idea in order to widen the scope, which can contribute to the growth of literature, is to evaluate the representatives from different areas (academia, research institutes) that were participating in these programs and the diverse projects. Furthermore, a more ambitious continuation of this study would be to extend the objective of study to other policy instruments with the same aim to tackle societal challenges. This in order to truly shed light to the innovation policies' experienced effect among the actors. Moreover, it would also be interesting to evaluate the innovation program by applying a quantitative methodology.

Another possible direction for future research would be to evaluate the third frame of innovation policy in more detail since it is still relatively new and is just in the beginning of the implementation phase of the systematic approach. It would in that sense be interesting to see the development of these frames as well as how the different frames might overlap each other over time.

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Interviewee 4: Project Leader CDI-B. (2017). (Personal Communication, 24th of April 2017). [Recording available at request]

Interviewee 5: Project Leader SIP-X. (2017). (Personal Communication, 12th of April 2017). [Recording available at request]

Interviewee 6: Project Leader SIP-Y. (2017). (Personal Communication, 24th of April 2017). [Recording available at request]

Appendix

Appendix A – Questionnaire for Enterprises

About the firm

Open-ended question: Tell us about your firm...

- *Specific issues to cover:*
 - *Founded (year), founder, main activity, number of employees, original idea or product/service, main customers, location,*

About participation in the Vinnova program

Open-ended question: How and why did you end up applying for and receiving support from Vinnova?

- *Specific issues to cover:*
 - *How the enterprise come across the program, Why they applied, contact with Vinnova, previous knowledge and relation to Vinnova, influence from Vinnova, general comments about the program, internal preparations for the program, other external support, evolutionary, experimental.*

About the project

Open-ended question: Tell us about the project that was funded...

- *Specific issues to cover:*
 - *Large/small, central/peripheral to firm activities, importance of the support, alternatives in how the project was conducted as a result of external support, acceleration, scale, other markets, new actors, alternative funding, collaborators*

About changes on the firm level

Open-ended question: In what way do you think/experience that the firm has changed as a result of participating in the program?

- *Specific issues to cover:*
 - *Positive/negative/no difference, worth it'?, unique effects, factors for success of the support, increased incentives to apply for support?, applying for more external funding now?, attitudes toward the support, motivation and focus, ambition, risk, new products, new markets,*

customers, context, competitors, networks, collaborations, the support as marketing resource, 'quality marker', increased knowledge (about market, general climate, support and public support activities), permanent changes in any of these?, time factors

Appendix B - Questionnaire for Program Manager

About the project manager

Open-ended question: Tell us about your background and your responsibilities at Vinnova...

- *Specific issues to cover:*
 - *Years of employment, title, main field of responsible, career background, education background*

About Vinnova and the background to the specific innovation program

Open-ended question: Tell us about Vinnova's role and the background to the innovation program...

- *Specific issues to cover:*
 - *Vinnova's purpose, how they work, their interaction with the government, models they apply*
 - *Where or by whom was the idea founded, previous knowledge and experience on the field of program, influence from the Government, influence by other (such as OECD), internal 'preparations' for the program, new structure*

About the program

Open-ended question: Tell us about the program and how the funding and decision process was constructed...

- *Specific issues to cover:*
 - *Aim, size of program (staff from Vinnova, time spectra, budget) requirements, decision process, decision committee, collaboration model (for instance triple helix), other included agencies, new actors, risks, common priorities, value, commercialization, new markets, specific actors, quality, evolutionary*

About the effect of the program

Open-ended question: In what way do you think/experience that the program has been a well-functioned instrument for its purpose...

- *Specific issues to cover:*
 - *Positive/negative/no difference, worth it, unique effects, factors for 'success' of the program, experienced attitudes among actors, motivation and focus, ambition, risk, new products,*

new markets, customers, context, competitors, networks, collaborations, the support as marketing resource, increased knowledge, knowledge sharing, time factors, received critics, experienced effect of collaborations, experienced effect of funding, evaluations, improvements, commercialization, legal rights, how to measure,

Appendix C – Coding Scheme

Frame 3.0	Focus on societal challenges & mission-oriented investments	Experimental & evolutionary approach	Collaboration, set ups, collective priorities
<p>Project CDI-A</p> <p>Acknowledges the negative externalities of economic growth, which leads to a greater focus on societal challenges.</p> <p>Both yes and no. No, since there, according to Vinnova, seemed to be lack of commercial value of the enterprise's invention. Yes, based on the description shows that the aim of the innovation project was to tackle societal challenges. Project within social sustainability and were in particular chosen for the field of competitive production, which was one of the four main fields for the program Challenge Driven Innovation</p>	<p>Mission-oriented investments - Shape & create markets.</p> <p>Yes, they got funded for step A, which was an investments from Vinnova, and the project followed the criteria to a larger spectra. Narrowed down to their specific project within the field. They find final users for their new invention that wanted to buy their service/product. They achieved to launch their innovation but mostly without public funding. The aim of the project was also to shape the market in order to create a model for social sustainability.</p>	<p>No best practice of sustainability – new pathways through new set ups of actions.</p> <p>Yes, the project leader was told by Vinnova that the program was an experiment. Their project, among 94 other projects got accepted for the first round (step A) of funding, that sense they created a new pathway.</p>	<p>Factors like skills, user preferences, regulations, policies and culture should co-evolve.</p> <p>Difficult to say yes or no on this one. However, user preferences are taken into account, the project leader have the skills within the field.</p>
<p>Project CDI-B</p> <p>Yes. Based on the project leaders description of the project have the focus been to tackle societal challenges. Was funded in the field of sustainable cities, which was one of the challenges addressed by the program</p>	<p>Mission-oriented investments - Shape & create markets.</p> <p>Yes, the project that was founded were in line with the mission. Narrowed down to their specific project within the field. The project aim was to shape/improve an already existing market. However, no information if the actual innovation achieved this.</p>	<p>Yes, especially because of their networking and including the end user in the process.</p> <p>Both yes and no. No concrete experience identified by the enterprise. However, their project, among 94 other projects got accepted for the first round (step A) of funding. The project leader experienced differences in approaches, where they and other SMEs are more innovative and academia have a more following up approach.</p>	<p>Difficult to say based on the interview.</p> <p>Difficult to answer if all of this factor co-evolve. However the user preferences are included in the innovation process, which co-evolve with the aim of the policy and regulation of program. Highlight networking, future customers and knowledge sharing as valuable.</p>
<p>Project SIP-X</p> <p>Yes. Based on the project leaders description of the project have the focus been to tackle societal challenges. The project was within Bioinnovation, which is a program that have a goal to innovate towards a bio-based society.</p>	<p>Mission-oriented investments - Shape & create markets.</p> <p>Yes, the project that was founded were in the line for the mission. They have seen a great demand for their product since they launched it and in that sense they argues that the innovation created a new market.</p>	<p>Yes, through collaboration with a new actor they created a new product which have been demanded on the market. This is a product that differ from similar product but it is sustainable.</p> <p>Yes, the SME are still interactive with other actors within the project. However, SIP-X finds it difficult to set off time for new collaboration though the project has ended, it offers opportunities to form new partnership for future innovation programs.</p>	<p>Difficult to answer if all of this factor co-evolve. Actors with skills on Bioinnovation as well as user preferences are taken into account.</p>
<p>Project SIP-Y</p> <p>Yes. Based on the project leaders description of the project have the focus been to tackle societal challenges. The project was within Bioinnovation, which is a program that have a goal to innovate towards a bio-based society.</p>	<p>Mission-oriented investments - Shape & create markets.</p> <p>Yes, the project that was founded were in the line for the mission. The overall aim of the project was to shape/create a new market. However, no information if the actual innovation achieved this. There were no concrete answer from the interview regarding this.</p> <p>Yes, there were no concrete information if the actual innovation achieved this. There were no concrete answer from the interview regarding this.</p>	<p>Nothing concrete found from the interview on these specific element.</p> <p>Yes, but it depends on which actors that receive the funding. The project leader saw the problem that research institutes and universities rather want a good result before a trial and error approach. However, the program is perfect for testing hypothesis.</p>	<p>Difficult to answer if all of this factor co-evolve. Actors with skills on Bioinnovation as well as user preferences are taken into account.</p>
	<p>Overall yes</p>	<p>Overall yes</p>	<p>Overall yes, but negative experiences of the collaboration, except for project SIP-X</p>