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Understanding Sustainability Transitions: The Perspective of Innovators in incumbent firms

**A case study of the roles and challenges faced by innovators and incumbent
firms**

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Abstract

Creating green sustainable innovation is a step in the right direction towards a sustainable future. It is however not sure that incremental improvements will be enough, it is instead called for radical shifts in socio-technical systems, so called sustainability transitions. Sustainability transitions research aims to create an understanding of how we could transform into creating a sustainable future. Transition research tends to use a holistic view in order to understand the macro perspective, but in order to understand the macro perspective, it is necessary to understand the micro perspectives within. This research is therefore focused on the micro perspective of innovators, and their role in sustainability transitions. The purpose of this research is to enlighten the perspective of innovators in relation to sustainability transitions. Sustainability transitions are fundamental shifts in industries, socio-technical systems and the society towards a sustainable production and consumption. This research uses the multi-level perspective of sustainability transitions to fulfill the research objective of understanding and enlightening the perspective of innovators. The multi-level perspective consists of three perspectives; niches, regimes and landscape. This research is focused on innovators within the regimes, currently working for large incumbent firms. The aim of using the multi-level perspective is to understand transitions and the role and symbioses between the perspectives, focusing on innovators.

This research is based on a qualitative research strategy, aiming to create a deeper understanding of the innovators as the research subject. This is done with a multiple case study, with innovators as the case objectives. The aim is therefore to study the innovators in their natural environment within large incumbent firms. The data is collected based on a purposive sample, to find the most appropriate research objective that can contribute to the purpose. The data were collected with semi-structured interviews of the research objectives, that we recorded and reviewed. The data were later analyzed with the help of thematic analysis, in order to reduce, interpret and identify patterns and relations in the data. The gathered data were then analyzed with the help of the data from systematic literature review in an abductive approach. The aim with this methodology is to find the best explanation of sustainability transition, and deepen the understanding, with the help of both previous research and gathered data. While it historically has been argued that incumbent actors of the regimes are resistant to changes, increased pressure could force them into transitions. The findings of this research suggest that incumbent firms therefore could act as followers to both niches and landscape changes. Furthermore, innovators can act as both influencers, and followers within their organization, it is however clear that innovators are vital in enabling organizations to create changes. Sustainability is highly affected by tragedy of the common, creating a challenge for incumbent firms. The current regime settings are in favor of them, therefore creating no incentives for changes. While organizations might be resistant to change, management, customers and time create challenges for innovators that are hard to overcome when working with sustainability transitions.

Keywords: Sustainability transitions, Transitions, Sustainability, Innovators, Incumbent firms, Multi-level perspective, Regime innovation, Role of innovators, Transition roles

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1. Introduction

This chapter aims at describing and discussing the background of the research. It will furthermore present and describe the research problem, purpose and contributions. At last, the research objectives that permeate the entire research is presented.

1.1 Research problem

Sustainable development could be described as meeting the needs of the present, without compromising the ability of future generations to meet their own needs (UN, n.d.A). Sustainable development and solutions are necessary in order for us to create a better life for upcoming generations of people. Development and new innovations have brought us an easier life, more money and made us a more developed people. But with a bright side of innovations, there is also a dark side. One of the main problems with lots of innovation is historically the unsustainable development. New innovations have made it easier for us to meet our own needs today, but eventually, it has started to compromise the ability for future generations to meet their needs. Impacts of climate change have caused increasing temperature, rising sea levels, flooding and drought, displaying millions of people, forcing them into poverty and hunger and denying them basic services such as health and education (UN, n.d.B). While sustainable development consists of ecological, social and economic perspectives, this research will mainly focus on the ecological part. When sustainability is discussed, it is therefore intended as ecological sustainability, mainly concerning climate change, this research is therefore limited to ecological sustainability. The unsustainable actions of today will not only compromise the ability of future generations, it is already affecting the current generation living in our world today.

Development and innovations are what have caused climate change to evolve, and innovations are also what is necessary for us to start a new sustainable life. New innovations can create better solutions, with less emission and impact on the climate. The concepts of eco-innovation, green innovation and environmental innovation are all closely related and focus on the creation of new products that provide customer and business's value, but significantly decrease the environmental impacts (Schiederig et.al, 2012). This is different from a 'regular' innovation whose interest is mainly to create customer and business value, sometimes at the expense of environmental impacts. While innovation studies could help to create a sustainable development, it does often demand a broader perspective (Smith et.al, 2010). Smith et.al (2010) argues that a broader perspective both regarding problem and analytical framing can and have done a lot to increase the significance of innovation studies in regards to sustainable development. Decreasing the environmental impact is one step in the right direction in creating a sustainable future for the upcoming generations. But just a decrease in environmental impact could potentially not be enough.

“These problems cannot be addressed by incremental improvements and technological fixes, but require radical shifts to new kinds of socio-technical systems, shifts which are called ‘sustainability transitions’” (Köhler et.al, p2, 2019).

Köhler et.al (2019) argues that we cannot fight climate change and unsustainable development with small incremental fixes. Instead we need to see radical changes with innovations and socio-technical systems, creating sustainability transitions. This research will therefore focus on sustainability from the perspective of sustainability transitions. The problem lies beyond a couple of unsustainable innovations that have been made, we have created an unsustainable way of life. It is therefore necessary that radical changes are made, with new sustainable innovation, but also new social norms that emphasizes sustainability. However, the progress of spreading technological innovations that are essential for the achievement of SDGs has been limited (Markard et.al, 2020). The existing systems of provision and consumptions are influenced by high degrees of inertia. Dynamics of radical innovations and inertia of existing systems are in the center of the research on sustainability transitions (Markard et.al, 2020). A central aim of transition research is to conceptualize and explain radical changes and how they can occur while societal functions still are fulfilled (Köhler et.al, 2019). Even if creating a sustainable future will demand a radical change, it is still necessary to fulfill the societal functions for the current generation. Studying sustainability with a perspective of transitions is therefore desirable. Transition research brings insight from different disciplines and theories, this creates a relationship between stability and change and increases the understanding (Köhler et.al, 2019). In regards to sustainability, transition research increases the understanding of what and how we could transform and create a sustainable future.

Firms and industry actors play a vital role in sustainability transitions, being one of the main drivers for innovations and development (Köhler et.al, 2019). Previous research has found that organizations' main role is to act as innovators, developing new products, services and business models, therefore shaping the pathways of transition and the future of the industry (Köhler et.al, 2019). Furthermore, firms and industry actors also matter in shaping the discourse, problem framing and expectations. Historically, large incumbent firms have been afraid of sustainability transitions, lobbying for it to slow down, instead of contributing to the transition. Incumbent firms are viewed as defending actors while niche newcomers are associated with radical innovations. It has instead been argued that niche level firms act for radical innovations and play the most important part of sustainability transitions (Berggren et.al, 2015). Berggren et.al (2015) however shows that incumbent firms could drive niche development further, competing both with new entrants and other incumbents. Köhler et.al (2019) also argues that incumbents are more and more keen on pushing for sustainable innovations within several different industries, increasing the importance of incumbent firms within transition research. Social movements for sustainability such as Fridays for future are significantly increasing with time (Fridays for future, n.d). The increase of social movements also creates a shift in consumer awareness and desires (Köhler et.al, 2019). The increased consumer awareness could potentially force incumbent firms and organizations into a radical

shift towards a sustainable business in order to keep their customers. Geels (2019) argue that once incumbent firms reorient their assets and competencies, there is an acceleration of sustainability transitions. This research will therefore focus on large incumbent firms to increase the understanding of innovations and transitions within large organizations. Berggren et.al (2015) does furthermore argue that once niche new entrants try to expand and spread their innovations their abilities are limited, emphasizing the importance of incumbent actors to be a part of the transitions.

Yet, the main research on sustainability transition has been done with a holistic view on macro and ‘meso’ perspective, often missing out on the micro perspective (Köhler et.al, 2019). When looking at transitions, users play an important role, with development and new innovations, it is therefore of utmost importance to understand the innovations and sustainability transition from a micro perspective. An innovator is a person who develops a new design, product, etc. or who has new ideas about how to do something. This research will focus on innovators as a person, i.e. the role of a single person within the organization, developing innovations and products. Innovators, on a micro level are the ones that actually are working with innovations, therefore being the driving force of development and sustainable transition. Businesses could therefore be forced into a sustainability transition by changes in consumer needs and behavior. They will therefore need the support of the people within organizations that are working with innovation i.e the innovators. Businesses do therefore need to understand how innovators are working, their view on sustainability transition and what support they could use to create the necessary innovations. This research will therefore not look at the organization as an innovator, but instead the people within organizations that are developing new innovative products. The research will not focus on a single industry or organization. Given the micro focus on the single innovators, the industry in which they are located is therefore less important. Instead the focus is based on the innovator and their thoughts. Holtz (2012) argues that an underlying understanding of the mechanisms that could generate transitions are required in order to successfully go through a transition. As innovations are a vital part of a sustainability transition, and innovators are the driving force of innovations, understanding innovators are therefore vital in a successful sustainability transition regardless of the industry or organization.

1.2 Purpose, research objectives and contributions

The purpose of this research is therefore to create an understanding of innovators, and their role in sustainability transitions. It is clear that innovations and incumbent firms play a vital role in transitions, and in order for innovations to be developed innovators are the most important actors. This research will therefore focus on innovators in large Swedish firms, and their role and view on sustainability transition. This research will also investigate organizational roles and challenges, based on the perspective of innovators. The purpose of this is to broaden the organizational perspective to include innovators, conclusion drawn on organizational level is therefore based on the innovator’s perspective. In order to fulfill this purpose the following main research objective will be pursued:

Main research objective: Enlighten the perspective of innovators in relation to sustainability transitions.

In order to fulfill the main research objective and purpose, three different sub objectives will be closely pursued:

Sub objective 1: Identify the potential roles of innovators within incumbent firms during sustainability transitions.

Sub objective 2: Identify the potential roles of incumbent firms during sustainability transitions.

Sub objective 3: Identify and analyze challenges faced by incumbent firms and innovators within incumbent firms during sustainability transition.

By reaching the research objectives, this research aims to contribute with knowledge on innovation and sustainability transitions from the innovators perspective. In a theoretical perspective does it contribute with necessary knowledge on one of the most important segments of sustainability transitions, innovations and more specifically innovators. A better understanding of how innovators understand and look at sustainability transitions brings a new perspective to the research area. This perspective contributes with a broader understanding and diversification of the concept of sustainability transitions to create a holistic understanding and further develop theory.

This research furthermore aims to enlighten the perspective of innovators, understanding the roles and challenges of innovators and incumbent firms is a vital step in enabling transitions. Research focused on organizations tends to focus on management and different stakeholders. This research is instead focused on innovators and aims to contribute with general firms knowledge based on the perspective of innovators. Practical knowledge on roles and challenges can enable innovators and organizations to create radical changes and transitions. Given innovator's importance in sustainability transitions, it is therefore necessary to understand innovators' role in sustainability transitions. This research contributes with the necessary practical knowledge and theoretical perspectives in order to enable the innovators to develop new radical sustainable innovations and transitions.

2. Literature review

This chapter aims at presenting and problematizing the existing literature related to the research objectives. The chapter will start by presenting sustainability transitions as well as the multi-level perspective. It will furthermore discuss Transition management, Technological Innovation Systems and incumbent firms. At last, change agents and transition pathways are discussed.

2.1 Sustainability transitions

2.1.1 What is sustainability transition

In order to understand development, innovations and the necessary transition towards a sustainable development this research will focus on the theory of sustainability transition. Transition research is focused on investigating processes of fundamental change in different systems of our society (Holtz, 2012). Different sectors and industries could be placed into different socio-technical systems, these systems are made of a network of actors (individuals, firms and organizations), institutions (norms, regulations and standards of good practice) and material and immaterial artifacts (Markard et.al, 2012). The different actors within the network interact in different ways and are dependent on each other. How these actors interact and are dependent, does have crucial implications on their dynamics and on systematic transformations (Markard et.al, 2012). A transition in the socio-technical systems is therefore a set of processes and changes that lead to a fundamental shift in the system. Transitions involve fundamental changes to the: technological, material, organizational, economic and socio-cultural dimensions (Markard et.al, 2012). Sustainable transitions are therefore major shifts in industries, socio-technical systems and societies towards a sustainable production and consumption (Markard et.al, 2012).

This shift requires radical innovations and changes in the way we live, produce and consume goods today. While conventional approaches with incremental innovation and changes have failed to do enough good for the climate, sustainability transition takes a holistic view facing the necessary radical changes (Köhler et.al, 2019). Sustainability approaches as eco-innovation, industrial ecology and environmental economies tend to focus on a single dimension, relatively short term and fails to acknowledge the systemic dimension. Sustainability transition on the other hand focuses on the big picture, is broader and more interdisciplinary in comparison (Köhler et.al, 2019).

2.1.2 Characteristics of sustainability transitions

Köhler et.al (2019) argue that sustainability transitions have several characteristics that makes it a distinct and demanding topic within the sustainability debate. First of all, it is multi-dimensionality and co-evolution, transitions are co-evolutionary processes that involve

changes in a range of elements and dimensions. Transitions consist of multiple interdependent developments, therefore not just focused on the single element or perspective. It also consists of multiple actors from academia, politics, industry, civil society and households (Köhler et.al, 2019). Transitions are complicated processes that can't be addressed by a single theory or discipline, different actors do therefore contribute with different capabilities and strategies.

Since the purpose of sustainability transitions is to create changes in the system, its research aims to understand the interactions between the radical changes and the force of stability in the world (Köhler et.al, 2019). The world is often striving for stability, with deeply routed systems of transportation and consumption, but on the other hand do we have the need for transition towards a sustainable future. Research on transitions do therefore aim to mobilize insights from different disciplines and theories to understand the relationship of change and stability (Köhler et.al, 2019). Given the long time it takes to develop and spread radical green innovations, as well as destabilizing and unlocking existing systems and incumbent firms, transitions are a long-term process. Transitions consist of open ended and uncertain pathways, given the multiple transition pathways always available, the future is always open ended when it comes to sustainability transitions.

At last, sustainability on its own is a highly debated and contested area, with a lot of disagreements on the right innovations and pathways. Sustainability transitions are therefore a highly distinct and demanding topic within sustainability (Köhler et.al, 2019). Sustainability transitions may threaten economic positions and business models of some of the most powerful and largest organizations. These incumbent firms are likely to protect their own interest and therefore contest the transitions ongoing (Köhler et.al, 2019). Furthermore is sustainability transition highly problematized from the prisoner's dilemma. Reaching a sustainable future is a public good, single private actors do therefore have low incentives in making the necessary changes. Public policies do therefore need to play a role in transitions, shaping the directions with environmental policies and regulations (Köhler et.al, 2019). All these characteristics of sustainability transitions indicate the complexity and width of the research (Köhler et.al, 2019).

2.2 Multi-level perspective

A multi-level perspective organizes analysis towards sociotechnical systems that consist of niches, regimes and landscapes (Smith et.al, 2010). The MLP emphasizes the importance of radical innovations, while understanding socio-technical transitions. Socio-technical transitions come from multiple social groups as firms, consumers, social movements, researchers and investors, who all are engaged in several different activities such as learning, debate, investment, conflict and goal-setting (Geels, 2019). The multi-level perspective consists of three different main perspectives; Niches, Regimes and Landscapes.

2.2.1 Niches

The MLP are dependent upon activities that occur within niches, niches are typically newcomers in their own niche area, where pressures are less evident and innovation easier

within a protected space for pathbreaking, radical innovation. Niches must be able to overcome and unsettle the already established and stable regimes existing within the socio-technical configuration. The role of niches in sustainability transitions is to provide protective spaces that could lead to new path-breaking and radical innovations. Historically, niches have been forced to overcome constraints built on influences of regimes, and over the long term drive transformations in the regime structures (Smith et.al, 2010). Niches are therefore facing a substantial risk of unsuccessfully expanding and surviving over time (Smith et.al, 2010). For niches to be successful they have to perform cognitive, institutional, economic as well as political work, and be successful over a large variety of fields. In this way, niches could compete with incumbent regimes, eventually outperform them and take over. They are therefore a major force of transformative ideas and capabilities, being constrained and enabled with the help of the powerful structures of the regimes deciding their potential (Smith et.al, 2010). Even if niches act in a protected space of less pressure, green niche innovations often face challenges that could hinder their development (Geels, 2019). Radical innovations tend to be more expensive, due to the lack of benefits from economies of scale and long time incremental innovations. There are always uncertainties in regards to the market and the user preferences, and radical innovations suffer a lot from liability of newness. This could make them perceived as unreliable and unfamiliar, therefore reducing their legitimacy, acceptance and access to financial resources (Geels, 2019). Even if niches act in a protected space, open for radical innovations, there are dozens of challenges in order to successfully implement a radical innovation.

2.2.2 Regimes

Socio-technical regimes are structures of accumulation and alignment of knowledge, investment, values and norms of the production and consumption that already exist. This is the established and dominant way of performing a task and realizing a societal function (Smith et.al, 2010). Regime dynamics is created from autonomous developments within the regime, which could be firm R&D or government regulations, this could eventually generate incremental response, development and innovations. The already existing dynamic structures of the regimes is what niches must overcome in order to reach a transition and unsettle the incumbent actors in the regime (Smith et.al, 2010). It is argued that radical innovations are created within niches, where regimes focus on incremental innovations, and new entrants nurture the development of alternatives (Köhler et.al, 2019). Geels (2019) argue that regimes tend to focus on incremental innovation due to a different set of mechanisms. First of all, sunk investments (competences and infrastructure) that create interests are opposite to the transitional change, as well as the high performance and low cost on their current technologies due to economies of scale and learning-by-doing experience. Secondly a set of social and cognitive lock-in mechanisms, such as routines, social capital and user lifestyle and practices that makes it hard for innovators and organizations to ‘think outside the box’. At last, institutional and political lock-in mechanisms, which are existing regulations, standards and policies that are in favor of the incumbers. As well as their power and opportunity to access policy networks to hinder regulatory change and new radical innovations (Geels, 2019). It is therefore often argued within the MLP that regimes tend to have a role against new radical innovations and transitions. While this is the original view of

the MLP, it has been shown several times that regime actors also can be a driver of new radical innovations and transitions (Köhler et.al, 2019; Berggren et.al, 2015; Penna & Geels, 2015).

2.2.3 Landscapes

The landscape of the MLP provides a context for regimes and niches, including societal functions, environmental and demographic change, social movements as well as cultural developments (Smith et.al, 2010). The landscapes provide niches and regimes a context in which they act and develop within. This context provides information on how to go on with needed innovations and the societal needs that have to be served (Smith et.al, 2010). Changes within the landscape could pressure actors on regime level, forcing a change upon them, creating new opportunities for niches. The increased awareness of sustainable development could be seen as a change in the landscape, questioning the performance of the regimes and creating opportunities for niches (Smith et.al, 2010). The MLP provides a way of organizing and simplifying the analyzation process of the highly complex processes of transitions (Smith et.al, 2010). Smith et.al (2010) argues that regime shifts occur with the help of inter-linkages as well as interactions between the three levels (niches, regimes and landscapes). This could then lead to new alternatives in niches but also openings for development in the regimes. The MLP is also criticized based on its emphasis on niche-derived innovations, instead suggesting that incremental innovation in regimes also could lead to radical changes over time (Smith et.al, 2010). The simplicity of niche, regime and landscape provides an understandable way of organizing and analyzing transitions, however there is a risk of becoming counterproductive by becoming too simple and therefore losing the complexity and holistic view that is central to sustainability transitions (Smith et.al, 2010).

Research on sustainability transitions have recognized that the civil society and different social movements have played an important part in transitions (Köhler et.al, 2019). Civil societies and social movements can build protective spaces for innovation, by creating support for the transition as well as effecting broader cultural values and beliefs (Köhler et.al, 2019). Research on transitions have gone from viewing the users and practices of everyday life as a passive consumer to instead looking at them as an active player in the socio-technological change. Looking at sustainability transition, users have played important roles in the developments of innovations such as wind turbines, solar energy and low energy housing (Köhler et.al, 2019).

2.2.4 Transitions within the multi-level perspective

The MLP argues that transitions often occur through interplay between niches, systems and landscape levels (Geels, 2019). The general dynamic of a transition in the multi-level perspective is niche-innovations start to build up a momentum, this momentum creates a landscape change that pressures the systems and regime actors. The destabilization of a regime creates an opportunity for the niche-innovations, possibly diffusion into the system and therefore disrupting the already existing systems (Geels, 2019). The focus of the multi-level perspective is the interplay between the different levels. While regimes are the established way of doing business in the socio-technical system, it is constantly affected by

changes that occur in both the landscape and niches. Niches are trying to find windows of opportunities for change in the regime, often created by changes that creates pressure from the landscape. While the already locked in regime might not be able or willing to react to the changes, it creates a window of opportunity for niches to destabilize the regime. This will then create adjustments in the current socio-technical system, potentially ending up in a transition with new and changed regime actors. The multi-level perspective argues that there are four different phases of a transition: Experimentation, Stabilization, Diffusion and Institutionalisation (Geels, 2019). Actors play different roles in the different phases, but over the course of the four phases do we see a transition that is happening in the socio-technical system. During the experimentation phase we see external influences on niche dynamics, where they see a change that they find interesting to experiment further with. During the stabilization phase, the landscape pressure gets stronger on the current regime, potentially creating windows of opportunity for the niches. The diffusion phase consists of a widespread diffusion of the niche actions, creating more pressure on the regime when niches capitalize on the opportunities that have arised. This will trigger major adjustments in the current socio-technical system, creating the last phase of institutionalization. During this phase will the new transformed socio-technical regime be set, therefore completing the transition. (Geels, 2019)

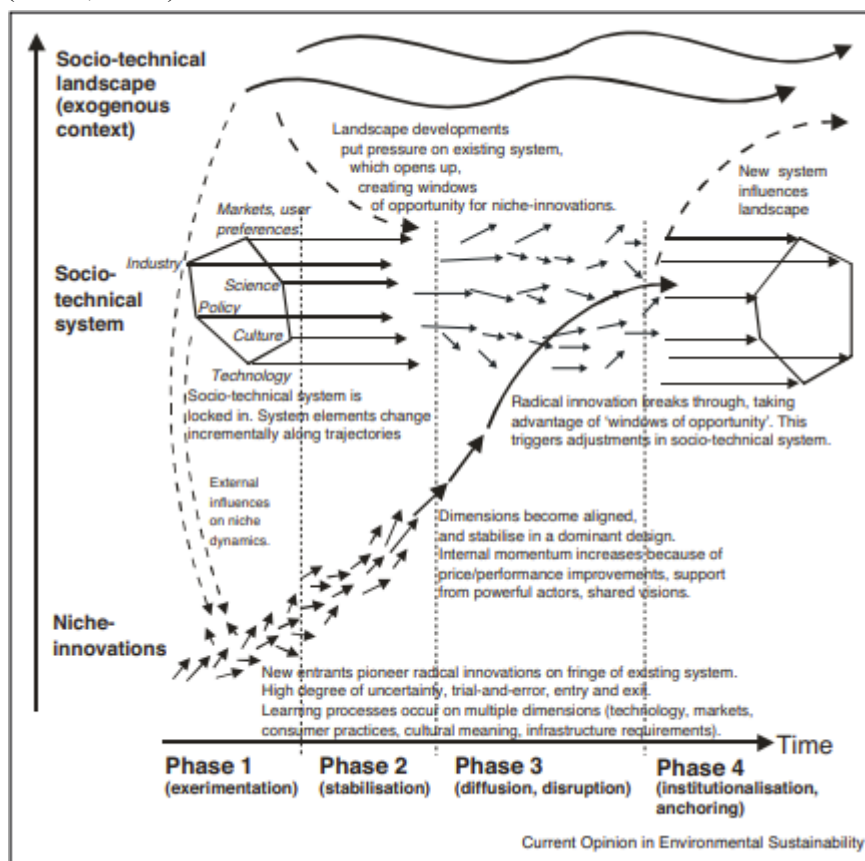


Figure 1: *Multi-level perspective on socio-technical transitions.* (Geels, 2019, p 191).

2.2.5 Critique of the multi-level perspective

The multi-level perspective has gotten a lot of critique over the years for different aspects (Geels, 2019). One critique has been the lack of a political dimension, however has this been

conceptualized over the years. Politics and policies play an important role in transitions, as a driving force and pathfinder. Issues with sustainability suffer from the tragedy of the commons, where no one owns the problem themselves. This often results in a social climate where no one addresses the problem instead. The role of politics as a driving force in sustainability transitions is therefore vital. However, this lack of political dimension has been addressed with additions to the MLP with the help of political economy ideas and Sabatier's advocacy framework (Geels, 2019). Furthermore could the political aspect be viewed as a part of the landscape, where politics shape the landscape of where regimes and niches act. Furthermore the singular, bottom up transitions pathway has been revised and critiqued (Geels, 2019). Instead of arguing that radical innovation occurs in a bottom up way, it has been argued that it can vest from several different pathways. It is shown that regime actors use both internal and external resources to develop new radical innovations (Geels, 2019). Transitions could therefore come from within incumbent firms, but incumbent firms sometimes also use external resources to create radical changes outside of the boundaries of their organization. However, the MLP is still useful to understand the different pathways in which the transitions could take, even though it might not be the typical bottom-up pathway (Geels, 2019). At last, it was argued that policymakers will have a hard time in directing sustainability transitions from the outside, because they depend on others for knowledge, resources and innovations, and given the open-ended and uncertain process of a transition (Geels, 2019). Instead, the strategic niche management was developed and argued that policymakers can increase and stimulate transitions and innovations with R&D funding, real-world experiments and projects. An appealing sustainability vision could therefore be a driver of transitions and the orchestration of transformative coalitions and radical innovations (Geels, 2019). Even if a lot of the critique to the MLP is based on valid points, a lot of them has been developed further, and as an analytical tool in understanding the holistic view of sustainability transitions, MLP is still a useful framework.

2.2.6 Strategic Niche Management

Strategic niche management is a combination of sociology of innovation and evolutionary economics. SNM is used to analyze the emergence of new innovations and argues that radical innovations mainly are developed in protected spaces (Köhler et.al, 2019). These protected spaces nurture sustainable innovations by creating technological niches (Schot & Geels, 2008). It is developed with social networks, vision and by newcomers and outsiders who are willing to invest time and money to develop a new innovation (Köhler et.al, 2019). It is shown that even if the SNM argues that radical innovations are developed in niches and are crucial for regime shifts, it is not the sole force of doing so. Transitions within niches could be nurtured with R&D fundings, real-world experiments, articulation of ambitious sustainability visions and orchestration of coalitions including new entrants as NGOs, cities and start-ups. The strategic niche management could therefore be used in a wider sense, contextualized as a part of the multi-level perspective (Schot & Geels, 2008).

2.3 Technological Innovation System

2.3.1 Technological Innovation System framework

The technological innovation system (TIS) on the other hand is based on the innovation system theory and industrial economies. TIS is closely related to the MLP, they focus on common theoretical roots in order to study technological change (Markard & Truffer, 2008). They have however developed in different paths over the years, but can be used together to create a better understanding of radical innovation processes and socio-technical transitions (Markard & Truffer, 2008). The technological innovation system focuses on the dynamics of an innovations system, and to create an understanding of the dynamics centered around the technology (Markard et.al, 2015). It is defined as a set of elements; technologies, actors, networks and institutions, contributing to the development of new innovations in the specific field (Bergek et.al, 2015). This group of actors are dedicated to a common purpose, and could together develop and utilize new products (Bergek et.al, 2008). The technological innovation system focuses mainly on understanding the technological functions around the specific innovation system (Bergek et.al, 2015). The TIS perspective highlights interdependence amongst these elements, therefore also creating various synergizes created by collective assets that couldn't have been achieved in isolation (Bergek et.al, 2015). This focus is not limited to mature technological fields, but also serves a purpose on emergence and diffusion of radical innovations (Bergek et.al, 2015). Bergek et.al (2008) argues that an innovation system mainly is an analytical construction used to better understand system dynamics and performance. When in reality it could exist only with weak interaction between the components. Bergek et.al (2008) also argue that it is vital to analyze and understand how the innovation system is behaving in a set of key functions. These functions are therefore important for development of new technology and could be view from seven functions: 1) knowledge development and diffusion, 2) entrepreneurial experimentation, 3) influence on the direction of search, 4) market formation, 5) legitimation, 6) resource mobilization and 7) development of positive externalities (Köhler et.al, 2019; Bergek et.al, 2008).

These seven functions are at the core of the innovation system approach, and the main benefit of this approach is the focus on what it actually achieved in the system, instead of the structure (Bergek et.al, 2008). Within the field of sustainability transitions does TIS contribute with a framework made for analysis and understanding the complex nature. The focus is on understanding the obstacles for growth of new industries and innovations (Bergek et.al, 2015). This could be used to understand incumbent firms and their challenges for sustainability transitions in the same way that it previously have been used to understand niches.

2.3.2 Creative destruction of technological innovation systems

Kivimaa and Kern (2016) argue that sustainability transition needs to involve policies that are aiming for creation of new innovation, but also policies for 'destroying' the old ones. The urgency of sustainability transitions does require explicit work on active destabilization (Kivimaa & Kern, 2016). While transition typically involves a broad range of actors over a long time-span up to more than 50 years (Markard et.al, 2012), it might not be fast enough for a sustainability transition to be accomplished over such a long time. It is therefore not enough

to rely on emergence and growth of alternatives to replace the current incumbent systems, therefore also requiring an explicit analysis of active destabilization (Kivimaa & Kern, 2016). Kivimaa and Kern (2016) argue that an extension to the TIS framework that helps to highlight the functions that are needed, not only to support new innovation, but also for destabilization of existing regimes are necessary for sustainability transitions. A mix of policies are needed for both processes to work in a mutually reinforcing way. While sustainability transitions are enabled with the help of destabilization of the established socio-technical regimes, it could be related to the concept of creative destruction (Kivimaa & Kern, 2016). Creative destruction is a process where innovative niches challenge incumbent firms, forcing themselves into the market and pushing incumbents to withdraw. Kivimaa and Kern (2016) built on the concept of Technological innovation systems and added new functions for regime destabilization, and combined them with the support functions for niche innovations, creating a policy mix for sustainability transitions. Kivimaa and Kern (2016) argue that a set of policies could help destabilize the current regimes: Control policies, Significant changes in regime rules, Reduced support for dominant regime technologies and Changes in social networks replacement of key actors. The use of policies for destabilizing regimes, and established policies for creative niche support, a combination of both dimensions of creative destruction will be more likely to achieve transitions (Kivimaa & Kern, 2016).

2.3.3 Critique of the Technological Innovation System approach

Technological innovation has historically been used as a tool when studying transitions, however it has been criticized for its usefulness to understand transitions (Markard et.al, 2015). One critique that has been presented is that TIS lacks a clear theoretical foundation, and can therefore not be useful when it comes to transitions. Markard et.al (2015) agrees with some of the critique, but argues that the core concept of TIS still holds and can explain the processes of transitions well. The core elements of actors within the TIS perspective create knowledge, products and innovations, and are the base of the theoretical core within TIS. This core of TIS helps to explain 1, essential differences between systems 2, creation of variety 3, rigidity and path-dependency (Markard et.al, 2015). The TIS framework is still therefore useful when studying transitions. Furthermore, the key functions of the TIS framework create a theoretical foundation. While structures might look different between different innovation systems, the functions are assumed to be applicable to a broad range of systems (Markard et.al, 2015; Bergek et.al, 2008). The functions are the basis of understanding the transitions, identifying weaknesses and blocking mechanisms, and are therefore a relevant part of understanding sustainability transitions (Markard et.al, 2015).

2.4 Transition management

Early critiques towards sustainability transition were directed towards the lack of discussion on politics and its effects. However, this has changed over the years, and current research agrees that power and politics play an important part of sustainability transitions (Köhler et.al, 2019). Governing is also a well studied subject in regards to transitions. It is shown that governing of transitions have to be looked at from a plurality of actors, not just government from a top-down perspective. It is instead important to understand that uncertainty and

innovations may change over the time of the transition, and that governing plays an important part in all phases of transitions (Köhler et.al, 2019).

Transition management suggests that policy makers are able to influence and govern the transition through four different activities: strategic, tactical, operational, and reflexive (Loorbach, 2010). While the goal of a transition is ultimately chosen by the society, governments can create a pathway for a structural change (Rotmans et.al, 2001). Rotmans et.al (2001) argue that no single actor can lead the transition on their own, and are therefore looking to the government. Since all social actors look for the government to take the lead in transitions, the role of government and policy are inevitable and important (Rotmans et.al, 2001).

The strategic activities in a transition area are creating visions of potential pathways. It is based on the processes of vision development, strategic discussions, long-term goals and norms. In a complex sociopolitical context, opinion leaders and innovative alternatives are able to highly influence the debate, given the high uncertainty of the future. Transition management argues that long-term governance activities are a necessary part of creating sustainable development (Loorbach, 2010). Tactical activities on the other hand are steering activities related to the structures of regimes and societal systems. These activities are driven by interests and include established patterns and structures as regulations, institutions, organizations and networks. These tactical activities include all actors that are dealing with developing programs, regulations, networks and in general are representing certain interests to the sector (Loorbach, 2010). Looking at the operational activities, businesses and industries often carry out different innovation projects. Historically these innovations have often occurred in niches and only exceptions have led to a transition (Loorbach, 2010). At last, the reflexive activities are related to monitoring, assessing and evaluating the current policies, and are mainly established within existing institutions and organizations (Loorbach, 2010). These four activities together could be used to understand governing and potential future sustainability transitions. Governments could increase the participation of different actors, and help niches to become an important part of the future and involve them in the process (Rotmans et.al, 2001).

2.5 Incumbent firms and transitions

2.5.1 The role of incumbent firms

Incumbent firms are a vital part of transitions, either as a driving force or as a hinder for the new radical innovations. While the MLP originally has argued that incumbent firms mainly try to stop transitions, it has been shown to be a lot more complex than that (Köhler et.al, 2019). Incumbent firms often find themselves in a position where they oppose sustainability transitions (Geels, 2019). The incumbent firm often has a commitment to the existing socio-technical systems that are in place, their organization is built to do what they are doing on multiple levels. They do therefore tend to be resistant towards new radical innovations and transitions. Berggren et.al (2015) argues that niches are limited in their abilities to expand and spread their innovations, struggling to fight the resistance of the incumbent firms. However, research has started to develop a better understanding of transitions and the role of incumbent

firms, disproving the classical theory that new entrants do radical innovations and incumbents do incremental innovations (Geels, 2019). Incumbent firms can reorient towards green niche innovations when the economic opportunity arises, or forced by legislation and public opinion. When this happens and incumbent firms reorganize their financial assets, technical competencies and political capital, we can see an acceleration towards the sustainability transition (Geels, 2019). Berggren et.al (2015) argue that established incumbent firms are active at both levels, striving for both incremental and radical innovations. The strategies of incumbent firms do therefore play an important role in the interactions between niches and regimes. Regime actors tend to go outside of their current focus to develop new radical niche innovations, therefore competing with both incumbents and new entrants (Berggren et.al, 2015). Once an opportunity arises, incumbents are likely to respond by retaining their regime level activities, and at the same time develop a new position within niches (Berggren et.al, 2015). It is therefore necessary that niche and regime actors can work together and help each other to undergo a sustainability transition. The performance criteria for niche and regimes should come to as much correspondence as possible, this could transform what works in the niches into something that can work for regimes also (Berggren et.al, 2015). Multi-level actors that can enable market expansion beyond the original niches can create a hybrid of both regimes and niches that are required in order for sustainability transitions to become successful.

Even large incumbent international organizations could be an important part in transitions. Kranke and Quitsch (2021) argue that international organizations could create a better understanding of the transnational dynamic of incumbency, and at the same time have a better understanding of non-incumbent actors and their roles. International organizations may adopt roles that are different from the MLP logic, acting relatively fluid and capitalizing on ideas circulation in their environment (Kranke & Quitsch, 2021). Given the global nature of the sustainability issue, an increased role of large international organizations is a necessary step for a successful transition.

2.5.2 Resistance towards transitions

Due to the incumbent firms being heavily invested in the current socio-technical environment they tend to use different resistance strategies in order to hinder transitions (Geels, 2019). A sustainability transition could force incumbent firms to change their core technology, therefore making their investment in factories, skills and supply chain potentially useless (Penna & Geels, 2015). It will force incumbents to make new investments, which is both costly and risky. Incumbent do therefore tend to be resistant towards change and transitions. Information and framing strategies, financial incentives, organized pressure strategies, lobbying strategies as well as confrontational strategies are some of the examples of what incumbent firms use to resist transitions (Geels, 2019). Regime actors can also use discursive strategies to help their 'cause', controlling not only what is being discussed, but also how it is discussed (Geels, 2014). Incumbent firms do tend to have power both within the industry, but also politically, therefore often being successful in their resistance strategies (Geels, 2014). Compared to niches do regimes mobilize more resources, therefore being able to influence people and actors with their power. The problem of sustainability is requiring increased

external pressure in order to force a transition. Avoiding climate change is a collective good, highly suffering from the tragedy of the commons, making the change unlikely to start in markets (Penna & Geels, 2015). Instead the pressure tends to come from social movements, public opinion and policy makers. The ideology of capitalism and liberalism, with limited rules setting and market competition that are present in large parts of the world create even further problems regarding sustainability (Geels, 2014). Feola (2020) argues that capitalism should be considered a factor that permeates the whole socio-technical system, instead of just a smaller landscape factor of the MLP model. Capitalism should be considered as a vital factor in transition trajectories and a defining element of socio-technical systems (Feola, 2020). The preference of letting the market decide about innovations, instead of the government, led to more power for the regime actors with a lot of capabilities and financial resources. This also leads to the lack of power to take action once the market is heading in the ‘wrong’ direction, increasing the power of incumbent firms when they are resistant (Geels, 2014).

2.6 Change agents

As sustainability transitions call for fundamental changes in culture, regulations, funding models and routines, it is a complex process to go through successfully (Mintrom & Rogers, 2022). It is therefore important to continuously work with the processes and drive for it successfully. Mintrom and Rogers (2022) argue that change agents could play an important role in successfully driving sustainability transitions, while it has been argued for a long time that change agents are vital for creating organizational changes overall (Weick & Quinn, 1999; Armenakis et.al, 1993). Most people know that changes are needed, but the knowledge does not always turn into the appropriate actions. Lots of the people in positions that are able to drive sustainability transitions have a limited knowledge on the actions they must take to enable innovations and scale them into transitions (Mintrom & Rogers, 2022). Change agents could be an important actor in driving sustainability transitions in a successful way. Change agents could be politicians, members of community groups or representatives of industries (Mintrom & Rogers, 2022). While most research is done on a governance and policy level, change agents could potentially play the same role within large organizations, driving change and transitions. Mintrom and Rogers (2022) argue that collaborative capabilities are more important than position power for a change agent, and present six key actions for driving sustainability transitions;

1. Clarify the problem and articulate a shared vision - A problem clarification could help people understand why they are important and guide them towards solutions.
2. Engage others to identify workable solutions and implementation pathways - Bringing people together, engaging them is a vital step towards understanding and exploring how the problem potentially could be addressed.
3. Secure support from influential stakeholders - In order for transitions to be successful is it necessary to have support from people with capabilities and influential skills that can make a difference.

4. Establish effective monitoring tools and learning systems - Monitoring tools could help both the change agent to track progress, and provide feedback to on-going actions. Feedback could also increase learning and facilitate learning.
5. Foster long-term relationships of trust and mutual support - Given the significant moves and changes in status quo, it is important to have long-term trust and mutual support amongst all actors of transitions.
6. Develop narratives that support on-going action - Supporting the transitions with narratives could keep focus on the outcomes and the actions that are necessary to reach the goal. (Mintrom & Rogers, 2022)

By following these six steps, change agents could foster sustainability transitions and enable change. While the research is mainly focused on the government level, the theory and practice could be used within large organizations due to their complexity and resistance towards change. The role of change agents within organizational changes is a highly researched area, where the role of a change agent is to be the prime mover (Weick & Quinn, 1999). While working in a large group setting, changes are often influenced by stereotypes, abstraction, decrease ownership of ideas and less unique ideas, a main challenge for change agents is to neutralize these tendencies (Weick & Quinn, 1999). Armenakis et.al (1993) argues that change agents can affect employees and create a readiness for changes that are important for success. Change agents do therefore play an important role in creating and enabling changes within both organizations, but also sustainability transitions.

2.7 Transition pathways

2.7.1 The creation of different pathways

Transitions could be viewed as a change from one socio-technical regime, towards a new one (Geels & Schot, 2007). The pathway to the transition could therefore look different from case to case and from industry to industry. Geels and Schot (2007) developed a framework with four different transition pathways, based on a combination of two criterias; Timing of interactions and Nature of interaction. Given the base of the multi-level perspective and the focus on changes in regimes of transitions, the framework is focused on regime level interaction with niches and landscapes. The timing of interactions are a critical part of a transition. Depending on when interactions appear the pathways will become different (Geels & Schot, 2007). The interaction between landscape pressure and the state of niches in the socio-technical regime are especially important, landscape pressure on regimes will have different outcomes and pathways depending on the development of niche-innovations (Geels & Schot, 2007). An undeveloped niche might not be able to capitalize on a landscape pressure, while a fully developed niche could utilize the opportunity to create major changes in the regime. On the other hand, the nature of interaction does also affect the transition pathways. The pathway will differ depending if niches and landscape have a reinforcing or disruptive relationship with the regime. While reinforcing relationships have a stabilizing effect, disruptive relationships create extra pressure, creating impulses for change and transitions (Geels & Schot, 2007). Where there is no external landscape pressure, the regime will typically remain stable and reproduce itself. When in regards to sustainability transition there is increasing pressure from the landscape (Geels & Schot, 2007). Geels and Schot

(2007) argue that with the combination of these two criterias, there are four different transition pathways: transformation, reconfiguration, technological substitution, and de-alignment and re-alignment.

2.7.2 Pathway 1: Transformation path

The first pathway occurs at a time when there is a moderate landscape pressure, and niche-innovations lack the necessary development. The regime actors will then respond with a modification of their direction, and develop new innovation and a new path to move forwards (Geels & Schot, 2007). The landscape creates a moderate pressure on the regime, forcing them to reorient. Niches are yet not fully developed, and are therefore not able to take advantage of the pressure, not causing any major regime changes (Geels & Schot, 2007). In this pathway does the outsider play an important role, translating landscape pressures and drawing attention to negative externalities that regimes tend to neglect. Different societal groups can demand new solutions and mobilize public opinion, therefore creating tougher regulations (Geels & Schot, 2007). This is something that can be closely connected to the societal groups demanding new solutions for sustainability, perhaps forcing a transition. Regime actors tend to survive this pathway, forced to do some changes in social networks, but they grow out of the old regime through cumulative adjustment and reorientations. If the knowledge distance within the regime change is too large, regimes could add niche-innovation and their knowledge, but it will not disrupt the basic architecture of the socio-technical regime (Geels & Schot, 2007).

2.7.3 Pathway 2: De-alignment and re-alignment path

The second pathway occurs when there is a landscape change that is divergent, large and sudden (Geels & Schot, 2007). This will increase regime problems, causing regime actors to lose faith, and forcing them into de-alignment. Incumbents do lose faith in the potential of the regime, and in response they do not defend the regime which is signaled by declining R&D investments (Geels & Schot, 2007). This will create a space for new innovations to erupt, but in this path, there are no sufficiently developed niche-innovations. The unfilled space will instead lead to emergence of multiple embryonic niches. Eventually, there will be a dominant niche that will form the core of re-alignment of the new regime (Geels & Schot, 2007).

2.7.4 Pathway 3: Technological substitution

Geels and Schot (2007) argue that the third pathway will happen when there is a lot of landscape pressure, at a timing when niches are well developed and ready to erupt. The new radical innovations are well developed, but are stuck given the stable regimes. Regime actors think that the minor problems that occur can be fixed with the help of incremental innovations, therefore paying little attention to the niches. Without the pressure from landscapes, the regime will remain as a reproduction process. But when a specific shock and landscapes start to put a lot of pressure on the regime there will be major changes, creating opportunities for niche-innovations (Geels & Schot, 2007). The already well developed and stable niches can use this opportunity and gather momentum to enter a bigger market and replace the existing regime.

2.7.5 Pathway 4: Reconfiguration pathway

The fourth pathway is the reconfiguration pathway, which happens when there are symbiotic innovations (Geels & Schot, 2007). These innovations are initially developed in niches, but get adopted to the regime to solve their problems. The new adoptions are driven by economic motives, and will therefore not create any initial changes in regimes. In the reconfiguration pathway however the new regime grows out of the old, creating substantial changes in the architecture of the regime (Geels & Schot, 2007). This pathway is substantial in socio-technical systems that function with help of multiple technologies. Transitions are therefore caused by the breakthrough of multiple innovations simultaneously. Compared to the Transformation path will the reconfiguration pathway leave the regime with substantial changes in the basic architecture of the regime (Geels & Schot, 2007).

Understanding the criterias and different pathways of transitions could be an important part of understanding the transition itself. To enhance sustainability and create a transition towards a sustainable consumption and production could it be necessary to anticipate the different paths towards the goal.

3. Methodology

This chapter aims at discussing and presenting the different methodological choices made during the study. The section starts with a discussion of research strategy and design, and continues with data collection and analysis. At last are the quality of the research as well as limitations discussed.

3.1 Qualitative research strategy

This research is based on a qualitative research strategy. The aim of qualitative research is to create a deeper understanding of the research subjects. Qualitative research is useful in developing knowledge in poorly understood and complex areas (Fossey et.al, 2002). Knowledge generated from qualitative research is grounded in human experiences (Nowell et.al, 2017), it is therefore useful in researching innovators and sustainability transitions. The focus is therefore on creating a qualitative understanding with the use of semi-structured interviews. Instead of trying to quantify and create an objective reality like quantitative research tries, the qualitative research strategy is focused on words and understanding (Bryman & Bell, 2015). In order to increase understanding, this research focuses on the way that individuals interpret the social world and view reality. This qualitative approach helps to gain an understanding of how innovators view the reality and increase the knowledge from their perspective (Fossey et.al, 2002). The qualitative research approach lets the respondents show the world from their own perspective and reality, and does therefore focus on ‘seeing the world from their eyes’. This approach will highlight the different perspectives and

contribute to the purpose of the research. Central to creating a good qualitative research are how the participants' subjective meanings, action and social context as understood by them, are illustrated and interpreted (Fossey et.al, 2002). In order to create good qualitative research, focus is on the respondents, and their subjective perceptions of the reality. This creates an understanding and knowledge for both theoretical and practical contribution of how innovators think of and understand sustainability.

The purpose of the research will be somewhat based on an inductive approach. This is due to the fact that it will go from an observation to a theory (Graneheim et.al, 2017). Interviews generated the necessary data to draw conclusions and increase the understanding of innovators, this is then used in order to create theory. On the other hand, the research is also based on parts of a deductive perspective, the interviews were somewhat based on previous research, and the data was analyzed with the help of theories and previous studies (Graneheim et.al 2017). The research will therefore work with theory and observations in an iterative way, and it could therefore be best described as an abductive approach (Bryman & Bell, 2015; Graneheim et.al 2017). The abductive approach is useful in creating a complete understanding of a phenomena, and implies a movement between both the inductive and deductive approach (Graneheim et.al 2017). The aim with the research is to seek the best possible explanation of the phenomenon, and deepen the understanding, with the help of both previous research and gathered data.

3.2 Case study

The design of this research is furthermore a case study. This is due to the fact that it will study a subject in its natural context to get a better understanding of the innovator (Bryman & Bell, 2015). The research focuses on a micro level on the single individuals. It is therefore a study of several different cases, where the individual innovators are the case subject. Innovation is a fast developing business, it is therefore necessary to explore and develop new theories continuously. While developing a new theory, a multiple case study is often an appropriate strategy (Goffin et.al, 2019; Eisenhardt, 2021). The choice of studying different cases to develop and deepen the understanding of innovators and sustainability is therefore necessary. The case study is grounded in the unique context of the innovator, with focus on understanding and learning from studied case subjects. It has interest in understanding innovators, and in order to do that we have to study them in their natural context. The setting of the case is therefore important, with carefully selected cases as a key factor to create an opportunity to learn (Eisenhardt, 2021). The objectives of this research provides opportunities for theory building, with little theory and empirical evidence present, making the multiple case study a perfect fit (Eisenhardt, 2021). The aim of the natural context is to increase the understanding of the segment of innovators in incumbent firms. A case study is known for being useful in creating a hypothesis, it is however also useful in testing hypotheses and drawing generalizing conclusions (Flyvbjerg, 2006). A case study is useful in social science when it comes to creating theories and generalizing, and is a necessary method in order to explore new areas of research (Flyvbjerg, 2006). The design of this study is therefore a multiple case study of innovators within large firms, focusing on their natural settings in order to create a better understanding of innovators.

3.3 Data collection

3.3.1 Sample and respondents

The sampling is based on a couple of different aspects. The main aspect of the sample is based on purposive sampling. The study does therefore not seek to create a sample based on a random basis, but the goal is to sample participants in a strategic way (Bryman & Bell, 2015). Given the nature of a case study, the sampling of cases is important in order to create a meaningful case (Eisenhardt, 2021). Given the purposive sampling the research does not aim to find conclusions that can be generalized over the whole population, but instead conclusions that can deepen the knowledge from the perspective of the innovator. The purposive sampling is based on respondents that can contribute to the purpose of this research the most. In order for the respondents to fit the purpose they need to fit the description of innovators. An innovator is defined as a person that develops new or current designs and products. The first and most important sampling criteria is that the respondents work with innovations. This means that the respondents have responsibility for products, product development or in any other way work with innovation within an organization. This is of utmost importance in regards to creating a sample that can contribute to the research question and fulfill the purpose. Other factors that will be regarded when it comes to the purposive sampling is experience with innovation, education and other work experiences. All the selected respondents fulfilled these criterias and were therefore selected in order to their ability to contribute to the purpose. Sampling did not focus on a particular industry or organization, due to the micro focus on the individual innovator, the industry of which the innovator works in is therefore less important. The researchers network were used to create a purposive sample with maximum variation. Given the use of the researchers network, and to decrease the risk of having struggles to find research objects, this research did use a convenience sample to ensure that enough respondents were found. Convenience sampling is effective when it comes to time, accessibility and money (Marshall, 1996). The convenience sample might lead to poor quality data and lacks intellectual credibility (Marshall, 1996), but given the time and resource limits of this study it is beneficial. Convenience sampling is therefore only secondary to the purposive sampling, all respondents need to meet the requirement of the purposive sampling and will therefore contribute to the purpose of the research. The research aims to create as much variation as possible in order to enhance the possible learnings, and benefit that can come from different perspectives and organizations within the subject of green innovation. Once the sampling had begun, it made use of snowball sampling to find further respondents. The respondents were asked if they know anyone else that could be a good fit as a respondent. This sampling process was done continuously and aimed to reach as much empirical saturation as possible given the time limits of the study.

Name:	Role:	Company
Respondent A	Product manager	A
Respondent B	Innovation Architect	A

Respondent C	Product developer	B
Respondent D	Product line manager	A
Respondent E	Product developer	B
Respondent F	Product engineer	B

Table 1: *Respondents and their role within their company.*

Company A is a publicly traded technology company with its base in Sweden. It has more than 750 employees and has operations in more than 15 different countries. Company B is a publicly traded industrial company based in Sweden. It has more than 35000 employees worldwide. The organizations were chosen based on their ability to contribute with innovators fit of the sampling as well as their size. However, both industries are highly innovative with an ongoing development. Given the micro focus on the innovators of this study, the industry settings are of less importance, the main focus being to find innovators that could contribute to the purpose regardless of the industry.

3.3.2 Semi-structured interviews

The purpose of qualitative research is to get a deeper understanding and see the world from the eyes of the respondent (Bryman & Bell, 2015). Given the structure of qualitative research this study uses a semi-structured interview in order to fulfill the purpose. The semi-structured interview is beneficial due to two different reasons (Kallio et.al, 2016). The first one is that it is flexible, it allows the researcher to pick up on new things, ask additional questions as well as it avoids to lead the respondent onto a specific path. Secondly, it provides enough structure to ensure that the interview stays on topic and discusses all the relevant aspects of the research (Bryman & Bell, 2017; Kallio et.al, 2016). The semi-structured interview enables reciprocity between interviewer and participant, allowing for both follow up questions and additional thoughts of the respondent (Kallio et.al, 2016). An unstructured interview could also have been an option, but due to the broad and extensive subject of sustainability and innovation this was opted out of. An unstructured interview with a broad subject can easily miss out on some of the relevant subjects (Bryman & Bell, 2017). The interviews were either done on-site or with the help of a video interview, based on the preferences of the respondent. This helps to increase the confidence of the respondent, as they can choose the best fit for them. The interviews were recorded in order to ensure that the researcher understands the respondent correctly. The recordings are transcribed and used in the analysis. With the use of recordings and transcriptions the researcher can fully focus on the respondent, and ask follow-up or clarification questions during the interview, instead of taking notes.

3.3.3 Interview guide

The semi-structured interviews are based upon an interview guide (see Appendix 1). This guide helps the researcher to stay on topic, and ensure that all interviews discuss all the relevant aspects. The interview guide was prepared beforehand and is based on different

topics and questions that are necessary for the research to meet its purpose. The interview guide is based on previous knowledge gathered from the systematic literature review (Kallio et.al, 2016). The aim of an interview guide is to ensure that the purpose of the research was met, without an interview guide the risk is that the research will miss the actual purpose and fade on to another subject. But the interview guide still brings enough freedom for the respondent to talk freely and express their own thoughts (Kallio et.al, 2016). The interview guide consists of questions and topics that are going to be discussed during the interview, the topics were developed and based on the purpose and the literature review. Furthermore, the interview guide helps to ensure that questions are asked in a reasonable order and creates a better flow during the interview. Even though the interview guide helped to create a reasonable order of asking questions, the semi-structured approach still brings the freedom to change order if the interview naturally calls for it (Bryman & Bell, 2015). At last, the interview guide helps to formulate questions in a comprehensive and open way that avoids asking leading or non understandable questions that can create a biased answer.

Given the importance of data collection for the quality and trustworthiness of the results (Kallio et.al, 2016), a lot of emphasis was placed on creating an interview guide fit for the subject. The questions in the interview guide are oriented towards the participant, not leading, clearworded as well as open ended (Kallio et.al, 2016). The aim of this guide is to get answers that are in-depth, unique and vivid. The successfulness of the interview guide is of importance in order to create a high quality analysis (Kallio et.al, 2016).

3.3.4 Review of collected data

Once the data was collected through the interview, the data was reviewed as soon as possible. This is done with the help of recordings and transcripts. The interviews are, with the approval of the respondents recorded in order to contribute to the analysis, and minimize the risk of misconceptions. Once an interview is done, it is transcribed with the help of a software. The transcriptions were then controlled while once again listening to the interview, to repeat the information, and make sure that the AI manufactured transcripts were correct. Listening to the recording also increased the understanding of the answers, and minimized the risk of misinterpretations, as well as gave an opportunity to find questions or clarifications that might have been missed during the interview. The transcripts are then used when creating the data analysis.

3.4 Data analysis

The gathered data is analyzed with the help of thematic analysis. The main part of analyzing data is to reduce, interpret and identify patterns and relations. This will be done with the help of themes and a thematic analysis. Thematic analysis is a method that is highly helpful in identifying, analyzing, organizing, describing and reporting themes that are found in a set of data (Nowell et.al, 2017). The main challenge with analysis of qualitative research is the large database that often gets collected during the interview phase (Bryman & Bell, 2015). The risk is that the width of data makes it difficult to interpret and to carry out a genuine analysis. To overcome this problem the data is analyzed with the help of themes, and a thematic analysis. The main object with thematic analysis is to identify and analyze patterns

in the data. These patterns are called themes, which are meaningful and coherent patterns that are found between the different interviews (Bryman & Bell, 2015). Themes will provide the researcher with the basis of understanding of the data, that can be used in order to contribute to the general research question. Themes are therefore the basis of the analysis and conclusions. The main advantage of thematic analysis is that it is flexible and creates an understandable way of understanding the data (Bryman & Bell, 2015). Thematic analysis is a useful method in highlighting and understanding similarities and differences amongst different research perspectives (Nowell et.al, 2017). The well-structured approach of a thematic analysis is furthermore useful to summarize the key features of a large data set and produce organized findings (Nowell et.al, 2017).

Nowell et.al (2017) presents a step by step approach to thematic analysis, this approach was closely followed in order to increase the overall trustworthiness of the research. The process of analysis used could be described in different steps. The first step was to get familiar with the data (Nowell et.al, 2017), this was done with the help of recordings and transcripts. When transcribing the interviews, the researcher listened to the interviews once again, and also had the opportunity to read the transcripts to get familiarized with the data. Once the researcher is familiar with the data, the second step is to create initial codes that are closely related to the data (Nowell et.al, 2017). The initial codes are based on repetition and different factors found in the data. The coding process is when data is broken into component parts that are relevant for the analysis (Bryman & Bell, 2015). The coding process began as soon as possible as it could sharpen the understanding of the data as well as minimizing the feeling of being swamped by the data (Bryman & Bell, 2015). Once the initial codes were finalized, the search for the general themes started (Nowell et.al, 2017). The general themes are more closely related to the research question, while the initial codes are closely connected to the data. The search is done with the help of the initial codes with the purpose to find repetition and themes that could be used in the analysis, and are connected to the purpose of the research. The general themes are based on the initial codes, where several initial codes are combined into a general theme that is related to the research objectives. Once a first set of themes is identified, it is important to keep working with the themes, review and refine them (Nowell et.al, 2017). This is done in order to make sure that the themes tell a convincing story that reflects the data. It could also be useful to minimize the bias of the researcher, the more time the data and themes are reviewed the less likely that the themes (and therefore the analysis) will be biased. At last the themes were named and defined in order to be used in the analysis (initial codes and general themes are found in Appendix 2) (Nowell et.al, 2017).

3.5 Systematic literature review

In order to deepen the analysis and increase the understanding of the innovators, a systematic literature review was developed. The theoretical knowledge is the foundation for the research and works iteratively to the gathered data and brings a different perspective on the topic of innovation and sustainability (Xiao & Watson, 2019). A literature review is helpful in several different aspects, first of all it provides a base knowledge in connection to the research area (Bryman & Bell, 2015). Secondly, the theoretical review helps in creating a relevant interview guide, as well as an analytical base and increases the knowledge prior to the

interviews. At last the literature broadens the knowledge to include new variables which might have been missed otherwise, and helps with interpreting the gathered data (Bryman & Bell, 2015). The literature review is based on relevant literature in regards to the research question and purpose. The literature review increases the significance of the proposed research (Bryman & Bell, 2015). Once the interviews are ongoing the theoretical framework is further developed in relation to the themes touched upon in the interviews. It is therefore an iterative process between the interview and the theoretical framework where they will help each other to become well developed and bring different perspectives to the analysis. At last, a systematically conducted literature review can enhance the quality, replicability, reliability, and validity of the research (Xiao & Watson, 2019).

The systematic literature review is done in order to find relevant data and bring a theoretical perspective to the research. In order to make sure that the literature is relevant to the research questions, a number of factors are considered during the review. In order to find relevant articles, and make sure to find all the interesting data, a number of keywords are used when searching for data. The keywords are created from the research objectives, based on different domains of the objectives (Xiao & Watson, 2019). This study mainly used the keywords of: Sustainability transitions, transitions, Multi level perspective, Technological Innovation System, transition management, niches, regimes, change agents, innovation, sustainability, incumbent firms, innovators and creative destruction. The keywords ensured that the literature review stayed within topic, and that it contributed to the purpose of the research. A key factor when selecting keywords is to find a balance between exhaustiveness and precision (Xiao & Watson, 2019). Broad keywords can create exhaustive and inclusive results but with irrelevant articles included, while precise keywords improve the precision but might create missing records (Xiao & Watson, 2019). When using keywords is it important to define the area of research, as well as to choose suitable keywords. Synonyms, abbreviations and alternative spellings could potentially be pitfalls to miss out on relevant research (Bryman & Bell, 2015). These keywords were used in searches of different databases provided by the library, mainly Web of science and the Library of Gothenburg university website search. The found articles are then selected on a basis of different inclusion/exclusion criterias. The criterias need to be capable of classifying found research, it can be interpreted and needs to result in a manageable amount of literature to review (Xiao & Watson, 2019). The main criteria is the contribution to the research question and literature review. If the topic can't contribute to the purpose of the research, the article is not relevant to read. It is furthermore important to evaluate the quality of the research (Xiao & Watson, 2019). The quality was assessed based on the criterias of citations and year of publication. Given the rapid increase in research on the topic of sustainability transitions, older publications could potentially be less useful. While a highly cited publication often is well written and useful, it is also an indication that a lot of research has been done after it, potentially discrediting the research. The search for inclusion of research papers is first based on a review of the abstracts, followed by an additional quality assessment based on the full-text (Xiao & Watson, 2019). This research has furthermore used both backward search and forward search to complement the initial database search (Xiao & Watson, 2019). Backward searching is used in order to find helpful work that is cited in the read articles, this is useful to develop a

deeper understanding of interesting parts of the articles (Xiao & Watson, 2019). Forward search is used both in order to find new research, but also to understand the credibility of older publications, since newer research might have contradictory findings (Xiao & Watson, 2019). The aim during the literature review is to use first hand sources, the aim is therefore to use the original source of works, instead of secondary sources to increase the credibility of the review.

3.6 Quality of the research

3.6.1 Trustworthiness

While quality of research often has been assessed with the criterias of validity and reliability, it is argued that it is not the best fit for evaluating qualitative research (Bryman & Bell, 2015). Reliability and validity are critical and evaluates how well the research represents the absolute truth, while quantitative research aims to create an absolute truth, this qualitative research does not aim to create a single absolute truth (Bryman & Bell, 2015). It is therefore not helpful to evaluate this research on the basis of reliability and validity. This research does therefore aim to reach a high quality of trustworthiness. The trustworthiness of a qualitative research is made from four different criterias: credibility, transferability, dependability and confirmability (Bryman & Bell, 2015; Nowell et.al, 2017). The credibility evaluates how a researcher gets to conclusions and that the researcher has correctly understood the social reality in which they have conducted the research (Bryman & Bell, 2015). Credibility could be seen at the match between the views of the respondent and the researcher's representation of it (Nowell et.al, 2017). In order to increase the credibility of this research, the interviews were recorded, relistened, transcribed and reread, in order to minimize the risk of misunderstanding the respondents. The research has furthermore been read by the supervisor and other researchers during the process, in order to increase the credibility. While qualitative research does not necessarily aim to create an objective truth that can be generalized over different industries and countries, its transferability is still important (Bryman & Bell, 2015). To increase the transferability this research provides descriptions of the data as rich as possible, to make sense of the research and provide others the opportunity to judge the transferability of the research (Bryman & Bell, 2015; Nowell et.al, 2017). The dependability evaluates the research in which degree the conclusion is dependent on the researcher (Bryman & Bell, 2015). While the researcher conducted the research alone, a number of measures have been taken to improve the dependability. In order to achieve dependability, the research process is logical, traceable and clearly documented (Nowell et.al, 2017). Both supervision with the assigned supervisor as well as critical review of other researchers during the process have decreased the risk of a biased conclusion. Finally, complete records of the research process will be kept and accessible during the research, to ensure that everything has been done in a correct way. Confirmability is based on the concerns of the research's interpretations (Nowell et.al, 2017). Findings need to be clearly derived from the data, therefore requiring the researcher to demonstrate in what way conclusions and interpretations have been made (Nowell et.al, 2017). Confirmability is ensured by acting in good faith, and not pushing respondents to participate and/or answer in a specific way (Bryman & Bell, 2015). The personal values of the researcher should not be apparent in the research. It is

argued that confirmability is established when credibility, transferability and dependability all are achieved (Nowell et.al, 2017). One additional challenge regarding the trustworthiness of qualitative research is connected to a 'red thread' that embraces the entire research (Graneheim et.al 2017). To ensure a 'red thread' through the entire research, the research objectives and purpose has been central to developing all different parts of the research. In order to additionally increase the overall trustworthiness of this research several different actions have been taken. All respondents are presented anonymously, in order to increase the willingness to participate, and the honesty in the answers. The interviews were recorded, transcribed and presented by described empirical findings, all to make sure that the research biases were decreased and the transferability and overall trustworthiness increased.

3.6.2 Ethical considerations

In order to ensure that this research is considered ethical, a number of actions were taken. This research has closely followed the four principles of The European Code of Conduct for Research Integrity: Reliability, Honesty, Respect and Accountability (ALLEA, 2017). Reliability to ensure the quality of the methodology, use of resources and design of the research. Honesty to develop and present fair and unbiased research, with the help of transparency. With high respect for everyone involved in the research as participants and the overall society. At last, accountability for the research, from idea to publication and all the work in between. All of these principles are closely linked to the work of this methodology section. A well developed methodology and empirical section will make it easier to follow the research process and judge the ethical considerations of this research.

This research has further considered four main areas of ethics presented by Bryman and Bell (2015): Harm to participants, Lack of informed consent, Invasion of privacy and Deception. In order to ensure that no harm was caused to the participant they will be presented anonymously, and all participation was done on an optional basis. Anonymity will prevent anyone from knowing what a specific person has said, and it can therefore not harm them. Furthermore will the recordings of the interview be kept confidential and deleted once the research is done. In order to ensure the consent of the respondent a number of actions were taken. All respondents were asked if they would be willing to participate in an interview. In order for the respondents to make a judgment, the research was briefly presented to them before they decided upon participation. All respondents were informed that participation was optional, and that they can withdraw their participation upon any given time before, during and after the interview. This research has considered the privacy of the respondent closely, since this research is focused on the experiences and thoughts of the respondents, it is important not to invade on their privacy. In order to avoid invasion of their privacy, respondents were always allowed to refuse answering a question, and the anonymity also made sure their answers were not connected to them. In order to avoid deception a developed and distinct methodology section was written. This will make it easier to understand the research process, therefore minimizing the risk of deception and presenting the research as something other than what it is.

3.7 Limitations

This research aims to contribute with both practical and theoretical knowledge on innovators within large firms in relation to sustainability transitions. It is however limited by a different set of factors. First of all, this research is limited to large incumbent firms, its findings can therefore not be applicable to small firms, who often have different roles and face a different set of challenges. Secondly, the aim of the research is to highlight the perspective of innovators, but it does not aim to generalize and draw conclusions regarding the full population of innovators in incumbent firms. In order to draw a generalizing conclusion the research would have needed to be at a larger and more in depth scale. The research is on the other hand not limited to a single organization and/or industry. Its findings could therefore contribute to research over different industries. The research is conducted in Sweden, and given the geographical influence on sustainability transitions (Hansen & Coenen. 2015), the findings are limited to Swedish innovators and firms. The contributions are furthermore limited to innovation based industries. If an industry setting is set in stone, and therefore doesn't work with innovations and innovators to develop any future, the finding of this study will contribute. This contribution of this research is therefore limited to industries that are developing over time through new innovations. At last, the research is also limited to the perspective of ecological sustainability.

4.0 Empirical findings

This chapter aims at presenting the primary data collected during the interview sessions. The data is presented with the help of quotes and are closely related to the initial data.

4.1 The role of large firms in sustainability transitions

Innovative organizations could be built in different ways, it could be a startup trying to reach their market with their new radical innovation, but it could also be a large incumbent firm trying to develop their newest innovations. Large firms could also be a slow organization struggling to make the necessary decisions for the future. Incumbent large firms could all look different when it comes to innovations, sustainability and transitions.

“I think that large firms should take all the responsibility, they are the only ones who could make a large scale impact on sustainability.” - Respondent D

“I think that large companies should be the driving force of sustainability” - Respondent A

Incumbent firms are the ones who set the rules and norms of the industries, they do therefore possess the power to make a real difference and set new standards. Respondents of this research argued that large firms are the ones in need to take responsibility and be the driving force of sustainability.

“Everyone needs to do their own best” - Respondent B

While Respondent B suggests that large firms should be a part of the solution, it is argued that everyone needs to do their best. Customers, startups, medium sized firms and politicians should be a part of the change. And while everyone should do their own best, the reality is not always in line with that.

“Organizations only care about maximizing their profit. They will not deliver sustainability to you for fun” - Respondent E

Respondent E argues that organizations don't become sustainable for fun. Their main priority is to maximize their profit, and will therefore not deliver sustainability unless it could help them maximize their profit. It is therefore not always in line with the responsibility that innovators within large firms think that their organizations should take. While improving sustainability potentially could be a part of large organizations' roles, their main goal is rarely to create a sustainable world.

“To maximize sustainability we will need to close the company. That is the radical action, a closed business will have no negative impact on the environment at all.” - Respondent D

4.2 Large firms and their landscape

4.2.1 Competitors

An everlasting pressure on businesses are their competitors. All mature markets and industries are heavily competitive, forcing organizations to function as effectively as possible to stay competitive. A competitive landscape forces businesses to save as much as possible and maximize their profit. Innovators could feel like competitors and the endless money savings are a problem when it comes to sustainability efforts.

“How could we afford to become sustainable without disappearing from the market?”

“ I don't think businesses dare to become sustainable, there are always other companies ignoring sustainability ready to take your market shares”

- Respondent D

Sustainability is often linked to a higher cost, sustainability efforts in a competitive market could therefore be seen as a risk. Respondent D argues that there will always be a new company ignoring sustainability ready to steal your customers if you increase your price. If businesses don't make money, they will not survive, and a bankrupt business will not be able to create a sustainable market. It is therefore argued that it could be better to survive and work with some sustainability efforts.

“We will not survive if we don't make any money, and we will not be able to pursue a sustainable agenda if we don't exist. That would arguable be worse” - Respondent A

Respondent A argues that it is better to survive and pursue some kind of sustainability agenda, than pursuing a full agenda, being forced into bankruptcy by your competitors. But even if sustainability, innovations and changes often are considered expensive, there are upsides to implementing it.

“Businesses don’t make changes to lose money, they make it to reach a unique selling point in the market” - Respondent D

“If we can provide our customers with a sustainable option, a lot of them would choose it even if it was more expensive. We could then create pressure on our competitors to act in the same way” - Respondent C

While sustainability could be seen as a liability that is driving costs, it could also be a competitive advantage. Respondents C and D argue that sustainability could create an advantage in comparison to your competitors that refuse to focus on it, as long as there is an opportunity to create a unique selling point, and the customers demand it.

4.2.2 Customers

While competitors are always an important factor in the landscape of large businesses, the customers are the ones in charge. If customers demand more sustainable solutions, there will be changes in the markets, forcing all organizations to consider sustainability on a broader level.

“It is all about the customer and their needs. If the customer see the value of a sustainable options” Respondent C

“ It is the customers who forces businesses into changes” - Respondent A

Organizations do listen to their customers, if the customers see the value of sustainability, and demand a change, businesses will listen to them. Respondents A, C and E argue that the customer is the one who decides the direction of businesses.

“The customers are in charge, businesses are focused on maximizing their profits.” - Respondent E

“The needs of the customers will have to change first. Businesses don’t develop products to create a sustainable future, they develop the product that their customers demand. If the demand for sustainability changes, the supply will follow.” - Respondent D

Respondent D argues that the power of the customers is to create a demand for a certain product. If they demand a sustainable solution, the supplier will make sure to create that solution for them. However will they not create a sustainable solution if there is no demand, given their focus on maximizing profit.

4.2.3 Business partners and authorities

While the customers and competitors are an important part of innovators work with sustainability, their own business's partners are also important. Sometimes organizations are in need of good partners in order to create a sustainable product. Both suppliers and business partners (for example transportation and delivery of electricity) could be vital in offering a sustainable solution.

“There is a need for understanding amongst different partners and organizations who produce and deliver in different parts of the chain.” - Respondent A

“If the incumbent firms show the way, their business partners will have to follow” - Respondent D

Business partners will therefore have to be on the same page, otherwise there will be conflicts. If the end producer wants to create a sustainable offer for the consumers, they are dependent on their partners at all levels of the chain to be on that same page and deliver a sustainable product. Respondent D argues that the incumbent firms are powerful enough to demand sustainability, and force it upon their partners. Respondent E does on the other hand argue that it is authorities that could demand a change with the help of policies.

“It is the authorities that can demand actions. It is in their best of interest as well to create sustainable solutions” - Respondent E

“Unfortunately it is not always economically profitable to create sustainable innovations, in those cases is it important that there are political decisions and incentives to create sustainability.” - Respondent B

Political decisions could therefore be a part of creating new sustainable innovations. The highly economically focused organizations could be encouraged to focus on sustainability if it was profitable with the help of policies.

“They need to force businesses to do more, and not just what they feel like. There is a need for a better control system that could measure, control and book usage of material and energy. Where bad choices could lead to extra costs, to create incentives for businesses to make good choices.” - Respondent F

Authorities could use a control system to get a better understanding of what businesses use and waste during their productions. This could be helpful in order to create incentives for good choices and punishments for bad choices. Respondent F argues that this could be necessary to make sure that businesses make better choices.

4.2.4 Startups

Large organizations act in a landscape with partners, competitors, customers and authorities, but there are also new competitors in the form of innovative startups. While incumbent firms

have their stop in the market, startups aim to transit the market and create a change. Respondent B argues that startups are interesting for innovators to look at, but that they rarely create a significant change.

“We look at startup ideas that could be interesting, but it is very rarely something that creates a radical change.” - Respondent B

“I don’t think there could come a new startup that creates a significant change.” - Respondent C

Even if startups could come with interesting ideas, and a new way of viewing things, it is argued that they will have trouble making a significant difference. If their ideas are interesting for the incumbent firms, they could try to make their own version or even purchase the startup business.

“Startups don’t affect us as much as of today. But if there is a successful startup, we will see how we can use their idea and improve it for our own profits”. - Respondent A

“I don’t think startups will make a significant change when it comes to sustainability. Startups can not afford to choose the sustainable option, sustainability is too expensive for startups. Incumbent firms could however buy a startup and together create something amazing.” - Respondent D

Both respondents A and D argue that startups will have a hard time to make changes on their own. It is expensive to become sustainable, and startups do not have the margins to focus on that. It is instead argued that startups could together with incumbent firms create a significant change and create a sustainable solution.

4.3 Large firms and radical innovations

Incumbent firms could often be resistant to radical changes. They are happy with the current norms and skills required in the market. It is therefore not obvious that incumbent firms strive for radical changes and transitions.

“In our market are there small changes towards improvement, new radical ways of working are expensive” - Respondent A

“I don’t think we dare to do radical sustainability changes, our competitors will ‘steal’ our customers” - Respondent D

“There are ideas and initiatives all over the organization that work with sustainability. But there are no intentions to create a radical change.” - Respondent F

There is sometimes a fear of committing to new radical changes, changes could be expensive and risky. It is argued that an unsuccessful radical change could end up horrible, and it is

therefore better to continue with what they already are doing. Instead of radical changes, it is small changes that are demanded by customers. Organizations do therefore work with small incremental changes to become sustainable. Different parts of organizations do focus on sustainability, but their focus is not to create a radical change.

“I believe that the needs of the customer needs to change, and that will not happen radically, but over a long time. There are not many businesses that develops a product without a clear demand” - Respondent D

“Change happens over time, it is not enough that one business decides to change radically. The entire market needs to change first, including customers and partners.” - Respondent A

Incumbent firms are not the ones leading a radical change, but sustainability could call for a different case. Respondent C and E argue that they will be forced to think radically.

“Sometimes it is necessary to decide and lead the way, if it doesn't work out could we always go the other way.” - Respondent E

“I believe we need to think more radically. I believe that we could lead a sustainability transition, but it has to come from top management of the organization” - Respondent C

A radical thinking of an incumbent organization could take time, but it could also bring a lot of advantages. Respondent D argues that incumbent firms could make a lot of things happen, forcing sustainability on other organizations as well. Change will probably happen, but it could take time before we see incumbent firms changing their whole organization.

“Norms and rules are highly static, which makes it demanding to change, but it will happen.”
- Respondent A

“I think we will be radical, but it will take time. Once a large organization has changed, we will see a snowball effect where others will follow.” - Respondent E

Over time, there could be radical changes within incumbent firms. But given the size of the organization it will not happen overnight. But once the ball is rolling, it will cause effects both inside and outside of the incumbent organization.

“From my point of view is it our responsibility to make sure that enough change happens. I know that we have the opportunity and power to create a radical change.” - Respondent F

Even if it might take time, it could still be incumbent firms that lead the way of radical changes. Innovators feel like it could be their organizations responsibility to become sustainable, and lead the way for change. Respondent F argues that incumbent firms can use their knowledge and power to create a radical change if they want to.

“There have to be an economic benefit” - Respondent F

Even if an organization might have the ability to create a radical change, it does not necessarily mean that they will. There has to be a motivation to create the change, the motivation for change is mainly economical. If a radical change can create an economic benefit for the organization, they will probably change. But, as long as radical changes create an economic disadvantage, they will not happen.

4.4 The innovators role

Innovators play an important role in developing existing and new problems, therefore being an important part of the future for every business. While innovators are the one responsible for development, they do not always choose in which direction to develop. When it comes to sustainability, the management of a business plays the most important role in the future.

“The most important part is that management of the business takes an initiative when it comes to sustainability. Unless it comes from the management, it is hard for employees to push the sustainability issue” - Respondent B

“It is the management who have to make sustainability initiatives. Employees can only push for sustainability when the management has an interest in it.” - Respondent D

It is argued that management are the ones who have the power to refocus towards sustainability. While innovators are the ones in charge of development, if they don't have the support within the organization, they will not be able to innovate for sustainability.

“It is hard for me to affect anything. It is such a large decision that it has to be made by the management.” - Respondent C

“I don't think it is us innovators that can take that step, it is a centralized decision the entire organization has to make. Personally, I am not involved with sustainability, and it does not matter if I propose a direction unless the business will make a profit of it.” - Respondent E

The management should be a part of a large decision, and therefore a driving force of sustainability. Innovators could still be a part of creating a sustainable future for large organizations. Even if innovators might not be the ones driving change, they can still affect opinions and create a new way forward.

“Innovators might still be the ones leading the direction. They will be a large part of implementing sustainability.” - Respondent A

“I don't alone work with creating a solution, but you do discuss ideas and solutions on problems amongst colleagues.” - Respondent B

“You can influence more than you think by pushing for sustainability, if innovators push for it, management will have to listen.” - Respondent F

The role of an innovator could look different in different scenarios. Innovators could experience trouble with implementing their ideas if they lack the support from management. If the management leads the way, innovators do want to work with sustainability, but not on their own. Innovators could still be a vital part of leading the way towards new sustainable solutions, and could therefore also affect the management and therefore the entire organization. If innovators make an effort to influence the organization, their power is strong enough to potentially make a difference.

4.5 Challenges of transitions

There are a lot of challenges to overcome when working with innovations and sustainability. Different companies and businesses struggle with different challenges, innovators are no exception to that. Innovations can foster sustainability, but there are challenges in implementing them.

“The hardest part is that sustainability tends to drive cost, and our business focuses a lot on cost.” - Respondent C

“The biggest challenge is to find sustainable ways that doesn't cost too much” - Respondent A

“How sustainable can we afford to be?” - Respondent D

One challenge that innovators could face while working with sustainability is cost. While sustainable products and innovations could be expensive, the customers are not always willing to pay more for them. Cost is therefore one obstacle that potentially needs to be faced when working with sustainable innovations.

“One obstacle for sustainability is that the business model is not built for sustainability. A lot of businesses need to change the foundation of their business models in order to become sustainable.” - Respondent F

“We need to stay competitive anyways” - Respondent E

“If we don't make any money, the business will go bankrupt. There are always other low cost competitors without a sustainability agenda there to compete” - Respondent D

The problem with an increased cost is therefore that the business will lose competitiveness. Its competitors might not care about sustainability and could therefore potentially keep lower cost and prices. A lot of businesses need to change the foundation of their business model, towards a circular model. As long as their business model stays the same, it will be hard to become sustainable. As long as the customers don't care about sustainability, it will therefore

be hard to implement new sustainable innovations, and an even harder step to change the business model.

“We can develop pretty much any product, but it will never work without a specific need from the customer. The challenge is the change the needs, the customer needs is what drives innovations” - Respondent D

“It is all about the customer, and what they are demanding” - Respondent C

While sustainable innovations could drive cost, if the customers are demanding it, it could still be made. One challenge is therefore to create a change in demand and needs of the customers and within the organizations. If that obstacle is overcome, it will be easier to develop new sustainable innovation even if it might increase cost. While customers are an important part for every business, it is also important to create an understanding and agreement with its partners.

“A challenge is to create an understanding amongst different partners within and outside the organization.” - Respondent A

“It is important to get distributors, clients and customers on that same page.” - Respondent B

Even if the organization decides to make a change, there are still other partners which need to be onboard with the change. Every business has distributors and partners that are a vital part of their business, sometimes those might not move in the same direction as wanted. Which can create a challenge when creating new sustainable innovations. In order to make sure that all parts are onboard, the management needs to take action.

“It is hard for employees to drive sustainability, unless it comes from management” - Respondent B

“The management needs to be the driving force. The big challenge is to find someone who drives sustainability.” - Respondent A

Another challenge for innovators is therefore to get the management to drive sustainability. If the management is onboard, it could potentially help to overcome a lot of other obstacles as well. On the other hand, without management onboard, it could be a challenge at all to implement new sustainable innovations. Management could be a key to other challenges, but it could also be a challenge on its own.

“You can affect more than you think, but it has to be a base of interest for sustainability amongst the management. - Respondent F

Employees of the organization might be able to create some changes, if they push for sustainability together, respondent F argues that they can affect more than you think.

However, the management is still the ones in charge, and there has to be a ground of interest to build on, otherwise sustainability efforts won't lead anywhere. But, even if management is driving sustainability, it will still be a long way to go.

“Implementing sustainability will take a long time” - Respondent E

“To transform in a quick and powerful way, that turns into something else than nice words and greenwashing.” - Respondent F

Another challenge for sustainability is therefore the long and slow process of change within large organizations. Businesses do therefore work hard to transform in a powerful and fast way that makes a difference, instead of just nice words and greenwashing. Even if there is a decision to become sustainable and create new innovations, the implementation process will take time.

“The greatest challenge is to change our habits from scratch, the base of how we work is not sustainable.” - Respondent F

There are norms and rules of how an organization works, and the larger the organization, the more norms and rules are there. It is therefore hard to create change at the base of how an organization operates and works, given that it will have to change the deeply rooted norms that the organization is built upon. Such changes have to be powerful, and will take time to implement. To summarize, there are a lot of challenges for innovators and sustainability transitions, cost, competitiveness, partners, management and time could all be in the way for transitions in a large business.

5.0 Discussion

This chapter aims at discussing and analyzing the empirical findings based on the literature review. At first the roles of incumbent firms are discussed, before discussion the roles of the innovators. Furthermore are the challenges on an organizational level discussed, and at last are the innovator lever challenges presented.

5.1 Role of incumbent firms

Different businesses tend to have different capabilities and advantages, they therefore tend to have different roles within their industry. The case of sustainability transitions is no exception. Different incumbent firms will have different roles, within the same industry, but also across industries. Some might be the leader of transitions, while others fight to resist transitions. Historically, it has been argued that incumbent firms have a tendency to be resistant towards transitions, valuing the current regime norms high. Despite this, it is also

shown that incumbent firms both can drive transitions and be an active part in niche development (Berggren et.al, 2015; Köhler et.al, 2019). The role of incumbent firms is therefore fluent and could potentially differentiate over time, organizations and industries. This research will therefore discuss different roles that incumbent firms could take in relation to the perspective of their innovators.

5.1.1 Resistant to change

The multi-level perspective argues that different actors of the socio-technical system have different roles. Incumbent firms follow the established and dominant way of performing a task, while niches act in an innovative and protected hub (Smith et.al, 2010). Incumbent firms have historically therefore used a set of strategies such as; information and framing strategies, financial incentives, organized pressure strategies, lobbying strategies as well as confrontational strategies in order to resist transitions (Geels, 2019). While the landscape around niches and regimes tends to pressure the current regime, alongside changes in today's society. The pressure put on the regime will force them into changes, also creating windows of opportunity for niches to diffuse and transform the current regime. Nevertheless, as regime dynamics is developed from within the regime, its main development and innovations tend to stay incremental (Smith et.al, 2010). The socio-technical regime is normally changing incrementally alongside a decided trajectory. The role of an incumbent firm could therefore be to keep developing incremental innovations and fight for the current regime practice until the regime dynamics changes from landscape pressure and niche development. This argumentation is supported by respondent A who argues that their industry keeps making small incremental changes, as new and radical ways are too expensive. Respondent D also argues that incumbent firms don't dare to do radical changes, they are afraid that their competitors might steal their current customers. The fear of changes, is potentially what could stop incumbent firms from taking action and leading the way into a sustainability transition. With its role instead being to stay within the current regime practices as long as possible.

The structures and norms already existing within the regimes are what must be changed and overcome in order to create a transition and unsettle the regime actors. The incumbent firms, as regime actors, are the ones who set the current structures and norms. Their willingness to change those norms that work in favor of them, are arguably low. The willingness of regimes to voluntarily change the current regime practice and create a transition is an unnecessary risk. Respondent E argues that organizations only care about maximizing their profit, and that sustainable changes will not be delivered for fun. If the current regime practices works in favor of the incumbent firms, and they keep making a profit, they will not create any changes without a reason to do so. Their main role and goal will therefore be to keep the current regime practices and fight against any transitions.

Geels (2019) argues that there are a different set of mechanisms that marks incumbent firms focus on incremental innovations. Respondent F argues that there are sustainability ideas and initiatives all over the organization, there is however no intention in creating radical change. First of all, the sunk investments in the current regime practice creates a high performing and

low cost opportunity to keep using their current technology. Sustainability transition could force incumbent firms into changing their core technology, making their investment in the current factories, skills and supply chain useless (Penna & Geels, 2015). The current advantage of already invested money and knowledge that they already have will then be lost. Respondents A, C and D also argue that organizations tend to focus on their costs, and in order to keep their costs down, organizations resist changes and sustainability. Furthermore, the routines, social capital and current practices of the organization are working in favor of the current practice. Creating a transition would then overturn the current norms and rules of the organization, potentially forcing the entire organization into changes. Potentially ending up where the organization might not be just as effective and capable. At last, Geels (2019) argued that institutional and political lock-in mechanisms, as regulation and standards are already working in favor of the incumbent firms. They will therefore not voluntarily create a change to the current mechanisms. Respondent F also argues that the hardest part of becoming sustainable is to change the habits of the organization from scratch. The base upon which organizations are built upon is not meant to be sustainable, it is therefore necessary to create a change powerful enough to change the base of the organization. The base of the organization, and the norms of the regime, is all working in favor of the current practice. The easy way forward is therefore to keep working with the current regime practice and incremental innovations and development.

There is always uncertainty when it comes to new radical innovations. It suffers a lot from liability of newness, with uncertain market and user preferences, therefore increasing the risk in being a first mover towards a radical change. Respondent A and C instead both argue that businesses change due to being forced by its customers. Respondent D also argues that the needs of the customer will have to change first, once the customers demand a radical change, the incumbent firms will be able to respond to that and deliver it. But their role on their own is to stay within the current regime practice, as long as their customers want that. Investing in a new radical change to push for a sustainability transition, is risky both within the organization due to changes and sunk cost, but also risky when it comes to the liability of newness and unknown demand of the customers. Respondent A also argues that their organization only tends to focus on incremental innovations, due to the cost of radical changes. It is therefore unlikely that an incumbent firm will push for a transition on their own, instead they will be resistant towards change and transitions.

Another explanation why incumbent firms might favor the current regime practices when it comes to sustainability is the tragedy of the common. Penna and Geels (2015) argues that fighting climate change is a collective good, therefore highly affected by the problems of the tragedy of the common. It is therefore highly unlikely that changes will start in the free markets (Penna & Geels, 2015). The current preference of letting the market decide about innovations, is giving regime actors with the most capabilities and financial resources more power. This leads to a lack of power to take actions once the market is heading in the 'wrong' direction. It is therefore hard to force the regime actors to take actions of sustainability, potentially resulting in a role of incumbent firms as resistant to change. Both respondent E and D argue that it is important that political decisions are in favor of sustainable options in

order to create a transition. Businesses do otherwise keep their focus on business as usual. This highlights the problems of tragedy of the common, without someone forcing business into changes, changes will not happen. Policies could therefore be of importance, since one common role of incumbent firms is resistant to change. Kivimaa and Kern (2016) also argue that policies of both creating new innovations and ‘destroying’ old ones are important to create sustainability transitions. Without incentives of active destabilization of the old regime practices and creating new ones, transitions might not be fast enough, given the urgency of sustainability. This could force incumbent firms out of their role as resistant to transitions.

To summarize, incumbent firms often tend to be resistant to change. The current regime status is in favor of them, and they could therefore find it best to resist changes and transitions. This is however not the only role that an incumbent firm could take when it comes to transitions and sustainability.

5.1.2 Followers

Incumbent firms could potentially take the role as a follower. When it comes to transitions and changes in the landscape of the socio-technical system, incumbent firms could be seen as followers. Businesses tend to be followers to their customers, respondent C argues that it is all about the customers and respondent D argues that the needs of the customers have to change first. Businesses do not tend to develop a new product without a clear demand for the product. Respondent A also argues that changes happen over time, and the different actors all are a part of the change. It is not enough that one business decides to change radically, the entire market needs to change and be ready, including their partners and customers. This implies that incumbent firms act as followers, their role is to follow their partners and the changes in the landscape. If there is a change in demand or public opinion, incumbent firms will be open to changes, but there has to be someone who demands it from them. Geels (2019) argues that incumbent firms are able to reorient towards new green niche innovations when the economic opportunity arises. When the opportunity arises, incumbent firms reorganize their assets and competencies, creating an acceleration towards transitions. It could therefore be argued that incumbent firms and their innovators take a role as a follower of sustainability transitions.

Social movements are increasing when it comes to sustainability, creating a shift in consumer awareness and desires (Köhler et.al, 2019). This shift could be what is forcing incumbent firms into a change. If the social movements create a demand for sustainable products amongst the customers of the incumbent firms, it will also make businesses change. Respondent D argues that businesses don’t make changes to lose money, but to reach a unique selling point. If the demand for sustainable products is clear, businesses will do their best to reach that unique selling point before their competitors. When there is pressure for change from the landscape of the multi-level perspective, it is argued that it will create windows of opportunity for niches to grow and diffuse their innovations (Geels, 2019). However, if the incumbent firms are willing to follow the changes, and give up to the pressure, they could still have the advantage over niches. Respondent B argues that when it comes to sustainability, all businesses need to do their best. It could therefore be argued that

sustainability transitions could have different characteristics in comparison to other transitions. Sustainability is something that will affect everyone, there could therefore be a willingness to change amongst the employees. Both respondent F and A argue that innovators could be the leaders of sustainability, as a large part of changing the organization. If innovators push for sustainability, management will have to listen to them and make changes. It is therefore probable that incumbent firms could change to become more sustainable, if the landscape around them demands it.

Another factor that could force incumbent firms into being followers is policies and regulations. Respondent E and B both argue for the role of authorities, that it is in the authorities best interest in creating incentives for sustainability that could make it profitable to create a sustainability transition. Loorbach (2010) argues that transition management could govern and influence transition through different activities. Kivimaa and Kern (2016) does furthermore argue that policies of creating new innovations, and destabilizing the old practices could be a key to creating the necessary sustainability transitions. Respondent F also argues that control systems and policies could be key in order to create change. Incentives for sustainability could be the necessary push for incumbent firms to take responsibility and follow through on sustainability transitions. Incentives from authorities could potentially increase in the future to govern transitions. Increased incentives and governing activities could increase the importance of the role as a follower for incumbent firms in the future. To summarize, incumbent firms could take the role of a follower of transitions. Sustainability is a growing issue, with increasing pressure from social movements and customers, potentially forcing incumbent firms to act as followers and make changes that are necessary for a sustainability transition.

5.1.3 Adjust to niches

Niches are typically newcomers in their own area with less pressure, making innovation and radical thinking within their protected space easier (Smith et.al, 2010). Nevertheless, they still pose a real threat to regime actors. Niches are forced to overcome the constraints that are built on the influence of regimes, and drive the transition towards a new structure. With the help of pressure from the landscape, there are however opportunities for niches to disrupt the current regime and create significant changes in the socio-technical system (Geels, 2019). It could therefore be argued that niches are the ones creating transitions in their protected hub, while the role of the incumbent firms instead is to adjust to changes once they occur. When radical innovations created in niches break through in windows of opportunity that are created from landscape pressure, it will force actions from the incumbent firms. If the regime actors fail to act upon the changes, they will lose their position in the regime, getting replaced in the process of the transition to the new socio-technical system. If they fail with the role of adjusting to niche development, the advantage of being a regime actor will disappear. Respondents A and B argue that innovators look towards startups and evaluate startups assessing their ideas, potentially trying to use their ideas for their own winning. The role of incumbent firms could therefore be to adjust to new startup ideas, and then incorporate it into the system.

However, Geels and Schot (2007) argue that transitions take different pathways depending on the nature of the timing and interactions. If niches are well developed once the landscape pressure increases it could lead to a disruption of the current regime. The pathway of technological substitution could see niches gain momentum to enter a bigger market and replace the existing regime (Geels & Schot, 2007). It is therefore critical for incumbent firms to act upon changes, if innovations instead are developed in symbiosis, regime actors could find a new role during the transition. In conclusion, if incumbent firms should survive niche development, they need to take actions and be able to adjust in time once the landscape pressure is increased.

On the other hand, it is shown that even if radical innovations are developed in niches, it is not the sole force of doing so (Schot & Geels, 2008). Respondent B argues that even if they look after startups, it is very rarely that startups are able to create a radical change. Respondents A, C and D also argue that startups are not able to create a significant change, it could therefore be seen as unlikely that incumbent firms take a role as adjusting to new niche innovations. Incumbent firms are able to mobilize more resources, and are therefore able to influence people and the socio-technical system. It is therefore more likely that incumbent firms will be the driver of development. Respondent D specifically argues that it is hard for niches to make changes when it comes to sustainability. Creating sustainability is often expensive and could therefore be hard for startups to incorporate. In order to create a sustainability transition it is however not enough to make small changes towards a sustainable production and transportation, it is necessary to make fundamental changes to the business model. It could therefore be easier for incumbent firms to make incremental sustainability efforts and for niches to drive radical changes and sustainability transitions. The technological innovation system highlights the interdependence within different actors, while different actors tend to focus on different innovations, synergizes created by collective assets is an important part in creating development (Bergek et.al, 2015). Utilizing synergize amongst different actors could be key in creating a sustainability transition.

To summarize, incumbent firms do not necessarily take the role as followers to niches, sometimes regime actors are leading the development. Despite this, if niches have well developed radical innovations, it is important for the regime to be willing to change and adjust to niche development, even if it is not its main role.

5.1.4 Driving force of change

While incumbent firms historically tend to be resistant to change, and instead act as followers, sustainability transitions might demand a different approach. Incumbent firms could potentially be actively searching for both incremental and radical innovations at the same time (Berggren et.al, 2015). Respondent A argues that incumbent firms should be the main driving force of sustainability. Respondent D argues that large firms should take all responsibility, since they are the ones who can create a substantial change. It could therefore be argued that innovators are willing to change, and that they want their organizations to be the driving force of the change. If an incumbent firm decides to radically change to create and enable a sustainability transition, others will follow. They could therefore take a role as

leaders of sustainability transitions. Nevertheless, there are a set of challenges that could prevent incumbent firms from taking this role. Geels (2019) argues that incumbent firms are heavily invested in the current socio-technical environment, and that they will therefore not take steps away from what they are doing now, if not forced to it. A transition will call for fundamental changes in culture, regulations and routines, it is therefore both complex and risky to go through a sustainability transition (Mintrom & Rogers, 2022). Köhler et.al (2019) also argues that regime actors focus on incremental innovations, where new entrants nurture alternatives to the current options. Smith et.al (2010) argues that even if the main focus is on incremental innovations, over time it could create radical changes. Small innovator-lead steps towards sustainability, with new incremental innovations, could therefore potentially be a step towards a sustainability transition. Change agents could furthermore potentially influence incumbent firms into changing their norms, as change agents are vital in creating organizational change (Weick & Quinn, 1999; Armenakis et.al, 1993). Change agents could therefore be successful in driving and pushing for sustainability transitions, steering organizations into a leading role of sustainability transitions (Mintrom & Rogers, 2022). On the other hand, even if innovators think that incumbent firms should take responsibility, it is not clear that they will. Respondent D argues that they don't dare to do the necessary radical changes, without risking losing their customers. Respondent E argues that incumbent firms care about maximizing their profits, and therefore will not deliver sustainability for fun. Respondent D also argues that incumbent firms don't dare to change in fear of losing market shares to their competitors. This will arguably make it unlikely that incumbent firms take the role of driving sustainability transitions.

In conclusion, there are possibilities for incumbent firms for leading the way of sustainability transitions. Innovators think they should take responsibility and could potentially create radical changes over time. It is nevertheless unlikely that incumbent firms will abandon their current regime norms and practice, without being forced into it.

5.1.5 Most likely role of incumbent firms

It has been shown that incumbent firms could play different roles of sustainability transitions. Looking from the multi-level perspective on socio-technical transitions, the four different roles of incumbent firms are based on the different actors of the MLP (see figure 2). Role number 1 is to act as resistant to changes. As long as it is possible to stay in the current regime status, most incumbent first will prefer that. Respondent A, D and E argue that organizations are afraid of changes and therefore are resistant to them. Role number 2 of the incumbent firm is to act as followers to different changes in the landscape. When there occur changes in the landscape, organizations will be put under pressure and have to change. Respondents C, D and A argue that customers are the ones who have to demand the changes, when customers demand changes, changes will also come. Changes could also be pressured by authorities as well as social movements. Role number 3 is adjusting to niches, once niche development is advanced, they will start to pressure incumbent firms into changes. If the timing is correct and the landscape pressure also is evident, it will force changes on the incumbent firms. Role number 4 of the incumbent firms is to act as leaders of change. Respondents A and D argue that large firms have to take responsibility to become the driving

force, and that they are the ones who can create significant changes. they could therefore act as leaders of the transition and show the way to the new socio-technical system.

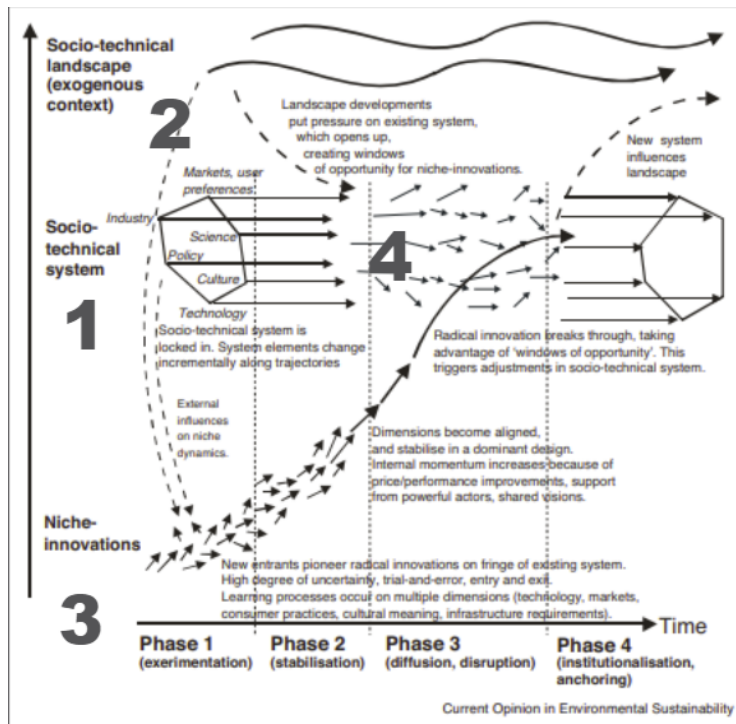


Figure 2: Roles of incumbent firms in multi-level perspective on socio-technical transitions. Based on: (Geels, 2019, p 191).

Even if incumbent firms potentially could be the driving force of sustainability transitions over time, it is unlikely that they will pursue that role. It is more likely that incumbent firms will act as followers, both to landscape pressure and to niche developments. If niches manage to develop new radical innovations, it is critical for incumbent firms that they are dynamic enough to adjust to the development. Even if it is not the main role of incumbent firms, they could be forced into the role of following new niche development. Despite this, incumbent firms tend to be resistant to change, as the current regime practices are in favor of them. While incumbent firms might risk missing out on new opportunities and changes, there is no reason for incumbent firms to create a change when it is not forced to. It is instead more likely that incumbent firms will act upon landscape pressure. As the sustainability issue is growing, the pressure from the social movements, partners, customers and politics are also growing. This will eventually force incumbent firms into acting as followers and adapting to the new situation. The role of incumbent firms is therefore not set in stone, different organizations will have different roles, and the same organization could also have different roles over different times. A firm that starts as resistant to change, could swing and become a driving force of transitions, if they believe that is the best for their organization in the current regime settings.

5.2 Role of innovators in sustainability transitions

Sustainability transitions are creating change in the system, it is therefore important to understand the interactions of change and stability in the world (Köhler et.al, 2019). While

social movements and customers might be the ones forcing organizations to change, innovators are the ones who create the change. Innovators roles in sustainability transitions could vary from industry to industry, business to business and even within the same organization. The main role of an innovator could be seen as satisfying their organization. Innovators within an incumbent firm are working for someone else, they can therefore not choose for themselves what they want to do. The most important part for innovators to be able to work with sustainability and to create transitions, is that their management takes initiatives. Respondent A and B both argue that the most important part is that management takes the initiative, without an management initiative, it is hard for innovators to push for sustainable solutions. Respondent D also argues that the management has to make the initiates, and can therefore enable innovators to focus on sustainability. The size of an incumbent firm forces decisions to be made from the management, respondent C argues that innovators can not affect anything. The role of an innovator could therefore be seen as tied to their management and organization. If the organization decides to change, the innovators should be there to fulfill them, but without the initiative from management it is hard for innovators to create changes.

Incumbent firms are committed to the existing socio-technical systems, the entire organization is built to do what they are doing now, including the innovators. Organizations could be resistant to changes, and are therefore not giving innovators complete freedom. Innovators instead have a fixed product and incremental innovations that they need to focus on. Given the organizations ties to the existing socio-technical systems, the innovators within the organizations are hired given their knowledge and skills of the current socio-technical systems. A transition could change the system, it could therefore also change the desired knowledge and skills of the innovators. It is therefore not given that innovators have the capabilities to lead or follow the change. Without the capabilities to create changes, innovators will focus on the current socio-technical system, also resisting changes with the fear of losing their worth to the organization in a transition. Innovators need to overcome the challenges of their own knowledge, as well as creating a future outside the current socio-technical system in order to create transitions. It is therefore unlikely that they will take the role as leaders of sustainability transitions.

It is hard for innovators to affect the management, but respondents A, B and D express interest in creating sustainability transformations. Given the nature of sustainability transitions, as sustainability issues are affecting everyone, innovators often have an interest in creating changes. Even if innovators might not possess all the necessary capabilities to create changes as it is, they are willing to learn, and want their organization to take responsibility. This indicates that innovators take the role as an internal influencers within the organization. Smith et.al (2010) argues that incremental innovations over time potentially could lead to radical changes and transitions. Incremental innovations created by innovators of incumbent firms could therefore still play a vital role in creating sustainability transitions. People in the positions that are able to drive sustainability transitions tend to have limited knowledge on the necessary actions (Mintrom & Rogers, 2022). The role of innovators as influencing people and the management within their organization is therefore important. Innovators could

act as change agents, and push for sustainability transitions (Mintrom & Rogers, 2022). Therefore influencing the management to create initiatives for sustainability. Respondent F argues that innovators can influence more than they think and that management will be forced to listen to them if they push for sustainability. Respondent A also argues that innovators could be the ones leading the direction of implementing sustainability. In order for transitions to happen, innovators could potentially play an important role in internal influencers in organizations. As innovators act as a part of a Technological Innovation System, the focus is on what can be achieved together (Bergek et.al, 2008). The focus is on the synergized effects amongst different actors, elements, technologies, networks and institutions that hold a common purpose. If the innovation system together tries to create a transition, they are not limited by the knowledge of a single innovator, but can instead utilize synergize within the system. The role of innovators is therefore important if the common synergies should lead to a sustainability transition.

It is however hard for innovators to implement sustainability and create radical changes without their management. The role of innovators is instead to influence their organization, and push for increased awareness and sustainability innovations within the organization. Innovators could act as a deciding factor for sustainability, and could therefore complement the landscape pressure on regime actors. If an incumbent firm is pressured by outside factors, such as politics, customer and social movement as well as innovator as an inside factor they will be more likely to change. If innovators push for radical sustainability changes, it could influence the management into believing that they are prepared for changes. It is therefore more likely that they will decide to commit to changes. Innovators of incumbent firms can not create change on their own, and do therefore not act as a driving force of sustainability transitions. Innovators of incumbent firms do however act as an important part of preparing and pushing their organizations into creating and following radical changes.

5.3 Challenges for sustainability transitions on an organizational level

There are a lot of different challenges for incumbent firms to overcome in sustainability transitions. Transitions are risky, costly, take time and challenge the current norms and practices of the organization. Incumbent firms therefore tend to be resistant to transitions, instead of creating them. When it comes to sustainability, it is often related to increased costs. Respondent C argues that the hardest part of sustainability is that it drives cost, and that their business is focused on cost. In a competitive landscape, it could be devastating to increase the cost. An increased cost could potentially make organizations lose customers to their competitors. Respondent D argues that organizations need to consider how sustainable they can afford to be. While cost is an obstacle in creating incremental development of sustainability, the challenges for radical changes and transitions are more complex. When creating radical changes, cost is still one of the main issues. Respondent F argues that there are ideas and initiatives within the organization that could create changes, but the intentions are not to create a radical change. In order to create transitions, the entire regime practice has to change, organizations will therefore be forced into finding new competences, and new ways of doing business. Incumbent firms' investments into the current socio-technical system will be considered a waste when the industry transforms, making their investment in

factories, skills and supply chain potentially useless (Penna & Geels, 2015). Cost is therefore an important obstacle when it comes to both incremental changes, and transitions.

Another obstacle for sustainability transitions is the competitive landscape. Respondent D argues that there will always be another low cost competitor without a sustainability agenda there to compete. The risk of losing customers to competitors makes both incremental innovations and radical changes risky for incumbent firms. Respondent A also argues that changes need to happen in the market first. The free market with high competition is creating an environment where low cost is important. Feola (2020) argues that capitalism is an important factor of the multi-level perspective, given that it permeates the entire socio-technical system and creates the playground. Capitalism creates a playground where no one dares to take the necessary step towards sustainability transitions, given the immense competition. The demand for radical changes are not enough for incumbent firms to dare to bet on creating radical changes that could lead to a sustainability transition. Sustainability issues are therefore heavily influenced by the tragedy of the common. Sustainability is a collective problem, where no single organization is in charge of the problem or the solution, therefore making it unlikely to start in the market (Penna & Geels, 2015). As long as businesses will benefit from exploiting ecological resources, they will keep doing it. Overcoming tragedy of the common is therefore one of the main challenges when it comes to sustainability. As long as the individual business is benefitting from their current acts, they will keep doing that. The challenge is therefore to find something that forces businesses into change.

Respondent A also argues that an understanding amongst customers, business partners and competitors is vital in order to create changes. Without a common understanding and willingness to change, organizations will stay the same. The multi-level perspective could be seen as a result of the tragedy of the common. Regimes are the ones who currently benefit from the socio-technical system, they therefore have no interest in creating any changes. Niches who are in protective places could however try to create a change in the socio-technical system once there is a pressure on the regimes. However, there has to be a pressure in order for niches to be able to create changes. Given the nature of sustainability issues, the pressure is not strong enough to force radical changes upon the regime. Respondent B argues that it is rare for startups to have enough power to create a radical change, Respondent C also argues that startups are incapable of creating a significant change. Overcoming the problem of tragedy of the commons will increase the pressure on the regimes, therefore forcing them into radical changes and creating opportunities for niches. An obstacle for sustainability transitions on an organizational level is therefore the lack of incentives to create the change. As long as the business benefits from the current regime practices, they will fight to keep the current socio-technical system.

In conclusion, there are different challenges for incumbent firms when it comes to sustainability transitions. The nature of sustainability issues makes it highly affected by the tragedy of the commons. Together with a highly competitive market that is fixated on costs creates several different challenges for sustainability transitions. Sustainability is a collective

problem, where no single business can fight the problem. As long as incumbent businesses benefit from the current regime practices, they will keep on doing what they do. In order to create changes, they will have to overcome the challenges of increased costs and a highly competitive market. The main challenge for organizations is to make it beneficial to create transitions, otherwise, they will remain in the current regime settings.

5.4 Challenges for sustainability transitions on an innovator level

While incumbent firms on an organizational level face challenges in sustainability transitions innovators face a different set of challenges. The main challenge for innovators to overcome is their own management. Respondent C argues that innovators can not affect anything, at the same time Respondent D and B argue that the most important part is that the management is on board. Without the management, it is hard for innovators to affect anything. The main challenge of sustainability transitions for innovators is therefore their own management. Mintrom and Rogers (2022) argue that people in the positions that can drive sustainability often have a limited knowledge on the necessary action. They do therefore act as an obstacle for innovators to implement their own ideas. Management is also the ones in charge of the tasks that innovators work with, they are therefore the ones that can enable innovators to create change. But if management has no interest in creating a radical change they are instead an obstacle for innovators to become a vital part of sustainability transitions.

Another challenge for innovators is their customers. Sustainability is often related to an increased cost, it is therefore necessary that sustainability is demanded from the customer if an innovator should work with it. Respondent C and D argue that it is all about the customer, if a customer demands something they can develop it. Respondent A also argues that customers as well as partners are important in order to create changes. Sustainability will not be delivered 'for fun' but instead to meet a customer demand that can make the business money. If sustainability is implemented with an increased cost, but not demanded by the customer, the customer might choose a competitor's product instead. On the other hand, if a customer is demanding a sustainable product from an innovator, they could act as an enabler for sustainability. An obstacle for innovators to overcome when working with sustainability is therefore the demand of the customer. When it comes to radical changes, the demand is not always clear. A sustainability transition is changing the socio-technical system, it is therefore not often demanded from customers. Only making changes that are demanded from customers will not lead to a sustainability transition. It will instead lead to incremental improvements of the current solutions. Creating innovations on the base of demand is therefore an obstacle to creating sustainability transitions.

The challenge for an innovator is furthermore to create radical changes that can lead to transitions, without a clear demand from their customers. It might be unclear where radical changes are heading prior to a transition, innovators do therefore have to work without a clear demand. It is therefore not guaranteed that innovators have the necessary capabilities and knowledge to actually create transitions. Innovators within an organization are hired in order to contribute with their experience and knowledge given the current socio-technical system. A sustainability transition will change the socio-technical system, potentially also changing

the desired capabilities of innovators. In order to create a sustainability transition, innovators need to have knowledge and capabilities that spread beyond the current socio-technical system. Without that knowledge, innovators will only create incremental development within the current socio-technical system. Innovators do therefore need to overcome the challenges of their own knowledge, as well as creating a future outside the current socio-technical system in order to create transitions.

Lastly, time is an important challenge for innovators. Respondent E argues that implementing sustainability will take a long time. Change is a long process when it comes to incumbent firms. Even if innovators have ideas, it will take time before they get implemented. Respondent F argues that the main challenge is to transform in a quick and powerful way, that turns into something else that nice words and greenwashing. Transitions are a long term process including both development and spread of radical green innovations, as well as destabilization of existing systems (Köhler et.al, 2019). It is therefore not enough that an innovator creates a new idea in order to create a sustainability transition. The current norms and practices within an incumbent firm are deeply rooted, even if there is a will to change them, it will take time to implement it. Even if there is a demand and will to create changes, time is a challenge when it comes to transitions, especially given the urgency of sustainability transitions.

To summarize, there are different challenges for innovators when it comes to sustainability transitions. In order for innovators to be able to create sustainable innovations, they have to be backed by their management. If the management has no interest in sustainability, it is hard for innovators to make any changes. Furthermore, the customer's demand needs to be in alignment with the changes. If there is no demand for sustainability, innovators will not develop sustainable innovation. Even if there is a demand for incremental sustainable innovations, if innovators were to completely focus on customer demand, they will likely only create incremental changes. Focusing on customer demand is therefore an obstacle when it comes to sustainability transitions. The knowledge of innovators, and creating a future outside the current socio-technical system are further challenges for innovators in a sustainability transition. Lastly, even if both management and customers are demanding sustainable innovations, transitions will take time. Norm and practices are deeply rooted and need to be changed over a long time. Given the urgency of the sustainability issue, time is a vital challenge. Management, customers and time collectively create a challenge for innovators at incumbent firms that are hard to overcome.

6. Conclusion and future research

This chapter aims at presenting and summarizing the conclusions of this research. At last, both implications of the study and suggestions for future research are discussed.

6.1 Conclusions

Research regarding sustainability in general and sustainability transitions in particular is an increasing topic. The aim of this research is to create an understanding of innovators at large firms, and their role in sustainability transitions. Innovators play an important role in creating radical and incremental business development, their role in sustainability transitions could nevertheless vary. Innovators act as an important part in preparing and pushing organizations into changes, both radical and incremental. Innovators can however not create radical changes on their own, but they do still play an important role in sustainability transitions. Depending on the organizational roles, innovators play different important roles in transitions. Incumbent firms tend to take different roles when it comes to sustainability transitions. Historically, incumbent firms tend to be resistant to change, innovators could then be stuck in the current regime status, playing little to no part in transitions, as their organization is resistant to change. An increased pressure from social movements, policies and customers could potentially force incumbent firms into transitions. Furthermore could niches act upon windows of opportunity in the regime forcing incumbent firms to act as followers and make radical changes. Incumbent firms could therefore take the role as both resistant and followers of sustainability transitions. When incumbent firms are forced into changes, the role of innovators is to create the necessary change and lead the organization into the transition. Incumbent firms do also have the opportunity to act as leaders of sustainability transitions, where innovators could act as change agents creating radical changes over time. An innovator's role is therefore dependent on the role of the organization, as the organization could act as resistant, followers as well as leaders. It could however be both as influencers on their organization as a change agent, but also as followers of their management as their power over the management could be seen as small. It is nevertheless clear that innovators are vital in enabling organizations to create changes, both as followers and leaders.

While innovators and their organization tend to have different roles over time, they have a set of general challenges they need to overcome when it comes to sustainability transitions. Sustainability is highly affected by the tragedy of the common, incumbent firms will therefore keep business as usual as long as they benefit from the current regime practice. An obstacle for organizations is therefore that it is not beneficial for them to create a transition. Increased cost and a highly competitive market act as obstacles for organizations trying to create changes. A lack of customer demand for sustainability transitions is furthermore a challenge when it comes to innovators. Organizations tend to focus their development on

customer demand, and if there is no demand for sustainability, innovators will likely not develop new sustainable innovations. Even if there is a demand for sustainable development, it tends to focus on incremental changes that will not lead to sustainability transitions. The customer focus is therefore a challenge for innovators when it comes to creating radical changes and sustainability transitions. The management of incumbent firms could furthermore be a challenge for innovators to overcome. With current regime practices in favor of the incumbent firm, management tends to be resistant to change, therefore making it hard for innovators to create significant changes. The knowledge of innovators is also based on the current socio-technical system, making the capabilities of innovators a challenge of sustainability transitions, given the nature of transitions that create radical changes to the socio-technical system. At last, even if both customers and management demand sustainable solutions, transitions happen over a long time. Given the urgency of sustainability, time is a vital challenge and obstacle in order to create a sustainability transition. Together, management, customers and time create challenges for innovators at incumbent firms that are hard to overcome.

To summarize, the roles of innovators and large organizations could vary over time and organization. Organizations could act as leaders, followers or resistant to change, while innovators act as influencers and enablers of changes. Together innovators and large organizations face a set of challenges in time, money, customer demand as well as the current practices of the organization.

6.2 Implications

This research contributes with findings and implications both on a theoretical and practical level. The theoretical implications of this research are the challenges for innovators and incumbent firms of customers, management and time. This is a base for future theoretical research that handles practical tips and implications on how to overcome the challenges. Further theoretical implications are the innovators role as influencers within the firm and incumbent firms' roles as leaders, followers or resistant to change. The roles of incumbent firms act as an addition and development to the already existing research of multi-level perspective, while innovators roles act as a new complement to previous research. This is vital knowledge in gaining an increased holistic view on transition research and the multi-level perspective. This research has identified the roles and challenges of sustainability transitions, which acts as a base for future research to be built upon this in order to identify best practices and keys to overcome challenges for organizations and innovators.

On a practical level does this research contribute with knowledge useful for both management, innovators and organizations as a whole. For the management of an organization does this research imply that their organization could take a different set of roles within a transition. Instead of only focusing on being resistant to change, management needs to understand that their organization also could be both followers and leaders of sustainability transitions. Management will therefore have to figure out their best possible role, given the industry, their position and their competitors. Management will furthermore know what challenges that both their organization and innovators could face during a sustainability

transition. The knowledge of challenges is a vital first step in overcoming them, if the management knows what challenges that could erupt, they have the opportunity to prepare the organization for them. The knowledge of challenges for innovators is also important both for the innovators itself, and the management. Knowing that customer focus, management and time creates challenges for innovators and sustainability transitions, both innovators and management could work together to overcome the challenges. The findings of this research enables innovators to contribute as much as possible during sustainability transitions. The different roles of innovators does also contribute to the organizations. The knowledge that an innovator could be both an influencer, change agent and follower, could be used by organizations to create sustainability transitions. This research could therefore help different organizations to find the best fit role for their own innovators. In conclusion could the roles and challenges identified on a practical level be used to prepare organizations and innovators for sustainability transitions.

6.3 Future research

This research has started the work of highlighting the perspective of innovators in relation to sustainability transitions. It is however a long way to go until this subject is researched enough. I do therefore propose four topics of future research: Overcome challenges, involving innovators, influencing management and best roles for innovators. This research has identified different challenges for both innovators and incumbent firms when it comes to sustainability transitions. It is however not enough to just identify the challenges, there needs to be tools to handle the challenges. If management and/or innovators know what challenges they might face during a transition, it is a first step in the right direction. They can therefore think of the challenges and try to find ways to deal with them. If future research also can provide practical tips and knowledge on how to overcome challenges, it will further enable organizations and innovators.

In order to further enable sustainability transitions and enable innovators to take part in transition work, there needs to be further research on how to involve innovators. It is clear that innovators believe that their organization should take responsibility, and that they want to work with sustainability. On the other hand, they feel like they don't get the chance to do the necessary work. Innovators possess the abilities and a will to work with sustainability and transitions, innovators are therefore capabilities hidden in the organization often forgotten about. Future research should therefore focus on how organizations in a successful way can involve innovators in their sustainability work, and how they can create transitions. Future research could therefore focus more on management, and their perspective of innovators. A better understanding of management in relation to the role of their innovators could be necessary to enable the full potential of the organization. Involvement of innovators is a key aspect in creating a successful transition, and is therefore an important future research.

Innovators tend to be interested in sustainability and are therefore willing to work with creating solutions. It is however not always that their management is on the same page. Managements tend to be resistant to change as long as the current regime status is in favor of their current work. Once management realizes that they have to change, it could however be

too late. Future research should therefore develop theories for how innovators could influence their own management into taking steps towards sustainability. Innovators tend to have a close relationship with both their customers and product, and therefore get a feeling of where the industry is heading. It is therefore key to make sure that innovators are involved, and that they can influence the organization. The organization can become more dynamic, adapt better to changes and use their full capabilities if innovators get involved.

At last, future research should focus on identifying the best roles in enabling sustainability transitions for both incumbent firms and their innovators. This research has identified which roles both innovators and incumbent firms could take. It has however not addressed the problem of which roles that could be seen as the best and most appropriate. The best roles are probably varying depending on industry, organization and management. But in order for organizations to best understand what roles they should aim for, and how they should use their innovators, future research is necessary. Moving towards radical changes could be seen as changing towards the dark. It is impossible to know what the industry will look like after a transition, which will make organizations scared of changes. If research identifies the best possible role for innovators and incumbent firms in relation to sustainability transition, it could be a useful tool for organizations to start with, when moving towards the necessary radical changes.

In conclusion, the topics of innovators and sustainability transitions is a topic that needs further research. Sustainability transitions will in order to create a sustainable future inevitably happen in most industries and regimes. It is therefore important to understand how to approach radical change and be ready for transitions. Understanding roles, involving innovators and overcoming the identified challenges will be key factors of future sustainability transitions. It is therefore necessary to further develop research on these topics.

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Appendices

Appendix 1: Interview guide

<p>Introduction</p>	<p>Short introduction to the topic and my thesis.</p> <p>1, Could you please tell me a little bit about yourself, what role and experiences you have?</p>
<p>General sustainability (To get going on the topic of sustainability)</p>	<p>1, What do you think are the biggest challenges in terms of sustainability today?</p> <p>2, What changes do you think will be required in the future?</p>
<p>Large companies (Questions connected to large companies and the role of the company)</p>	<p>1, What responsibility do you think large companies have connected to sustainability?</p> <p>2, What do you think is required to get large companies to change? Which challenges are the hardest?</p> <p>3, What changes have you noticed in the last 10-15 years? What changes do you think are required?</p>
<p>Innovator (Questions about the person as an innovator)</p>	<p>1, How do you work with sustainability? Would you like to work more with sustainability?</p> <p>2, What obstacles do you see to develop your sustainability work?</p> <p>3, Who do you think will be the driving force of sustainability transformations? What can you contribute with?</p>
<p>Radical innovations and transitions</p>	<p>1. Do you think it will require radical changes and innovations to achieve sustainability? Or do you think it will continue with minor changes?</p> <p>2. Do you think that you and your company have the opportunity to create a radical and fundamental change?</p>

	Who do you think can create a radical change? For example, you, management, teams or start-ups?
Startups	1, How do you think innovative startups can affect the industry? 2, Do you think we could see a fundamental change due to startups? 3, How can they affect you in a larger company? Do you think there is a risk that new companies "take your place" with new radical solutions?
Concluding	Are there anything else that you would like to add?

Appendix 2: Presentation of general themes and initial codes

Research objectives	General themes	Initial codes
Role of incumbent firms	Resistant Adjusting Driver Follower	Partners Competitive Competitors Change of needs Customer driven development Consumer pressure Power of incumbent firms Responsibility of incumbent firms Do your best Maximizing profit Government Laws Internal policies Start ups Hard environment for startups Industrial driven changes Snowball effect
Role of innovator	Influence the organization Push for sustainability Follow management Customer driven	Management driven Change of needs Customer demand Customer driven development Consumer pressure Maximizing profit Internal policies Innovators important

		Innovators leading Long way to go
Challenges for incumbent firms	Competitors Cost Time Norms Risk	Partners Distributors Transportation Increased costs Competitive Change of needs Customers Customer driven development Maximizing profit Government Laws Long way to go Internal policies Money Affording sustainability Profit to survive Norms and regulations Industrial driven changes
Challenges for innovators	Management Customers Demand for radical changes Cost Time	Management Management driven Competitive Change of needs Customer demand Customer driven development Consumer pressure Start with yourself Do your best Maximizing profit Internal policies Driving forces Slow-changing Goals Profit to survive Innovators leading Company agenda Incremental changes Industrial driven changes