Master Business Administration

The limiting effects of path dependence towards organizational change in the vehicle body building industry

UNIVERSITEIT TWENTE.

Abstract

The goal of this study is to identify the limiting effects of path dependence on organizational change through environmental influences. Whereby, the focus of the environmental influences within the study is on two different industries, namely the automotive- and flat-glass & glazing industry.

Results of this study describe the limiting effects of path dependence on organizational change through environmental influences. Besides the limiting effects, also the process of how to identify path dependence within SME's is comprehensively described. As a result, the enterprise under investigation could implement changes towards their business plan to decrease or prevent the limiting effects of these dependencies. Next to this, the identified path dependencies could also occur for similar enterprises, therefore the study could identify possible path dependencies for the vehicle body building industry.

The results derived from three different types of data, through a literature study, semi-structured interviews, and focus groups. The goal of the literature study was to gather more knowledge about the existing path dependence theory and describe the different phases within the process. Additionally, the existing theory of the two other constructs environmental influences and organizational change is used to define these two constructs. Subsequently, semi-structured interviews and focus groups are used to gather insights within the path dependencies that could occur in the future for the enterprise under investigation. Furthermore, the enterprise can correspond to other similar enterprises within the vehicle body building industry. As a result of corresponding, the results can also be accounted to enterprises in the vehicle body building industry. The data gathered within the semi-structured interviews and focus groups is based on possible futuristic scenarios for two industries which are mainly affecting the vehicle body building industry.

The participants within the semi-structured interviews are employees of an SME with the most knowledge and experience. Most of the time these employees carried a function in the field of a manager. Next to this, the participants within the focus groups where all other employees within the organization. These focus groups were segmented on divisions and nationality to prevent any miscommunications during the focus groups. At last, all the participants within the semi-structured interviews also took part in a focus group. Whereby, the researcher must try to prevent bias regarding a hierarchy perspective. As an example, there is a reasonable chance that employees agree faster with the CEO instead of a manager. The participants had to join one focus group because otherwise, they could influence participants in the other focus groups with regard to their answers or discussions. This influence is a result of the knowledge and experience that they possess more than the participants in the other focus groups.

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1. Introduction

1.1. Background information

Enterprises try to prepare themselves for possible futuristic environmental influences. These influences could be in the form of an economic crisis or boom, new technological developments, new competitors, etcetera. As a consequence of environmental influences, enterprises try to seek strategical changes which can cause an enterprise to change organizationally (Hillman et al., 2000). These organizational changes could be necessary to integrate new technologies, the discontinuing or establishment of "new" department, etc. Nevertheless, the relationship between environmental influences and organizational change is most of the time influenced within a negative perspective by path dependencies (Egidi and Narduzzo, 1997).

Path dependence is a concept which was originally used to support the theory behind the adoption of new technology within enterprises (Chhetri et al., 2009). This statement is supported by David (1985) who mentions that the technology which is first-to-market could develop a path dependency. For clarification, the QWERTY keyboard is the best-known phenomenon of path dependency developed by being the first-to-market. Additionally, Mahoney (2000) acknowledges that QWERTY can be seen as a path dependency. Whereby, the probability of adopting the substitute of QWERTY, Dvorak, decreased to zero after QWERTY past the point of "critical juncture" (Sygow et al., 2009).

Next to this, the concept of path dependence is often linked to the term rigidity. This is a result of the often-rigid character that path dependence contains (Leonard, 1992). Therefore, lots of researchers tried to describe the rigid character of path dependence towards enterprises (Liebowitz and Margolis, 1995; Sygow et al., 2009; Leonard, 1992; Hacklin et al., 2009). However, the limiting effects of path dependence on organizational change are not studied within the perspective of a single-case study. As a result, this study tries to describe how path dependencies could limit an SME their ability to change organizationally when environmental influences occur. Additional to the single case study, the study could give insights regarding the problems for the vehicle body building industry regarding path dependencies when particular scenarios occur. At last, the study contributes to the methodological process of identifying path dependencies, especially in a single case study.

1.2. Research objective and contribution

The focus of this study is to perform a path dependence identification process in an SME within the perspective of possible futuristic environmental influences. This identification process is done with the support of a literature review, semi-structured interviews, focus groups, and relevant futuristic scenarios. Next to the performed path identification process, the study also describes a brief literature review of the construct path dependence and the relationship between environmental influences and organizational change.

As already mentioned, there are a lot of investigators who studied the phenomenon of path dependence. As a result, the process of how path dependencies emerge is described by multiple studies (e.g. Sheikh and Zafar Iqbal Jadoon, 2011; Vergne and Durand, 2010; Sydow et al. 2009; Mahoney, 2000). On the other hand, the execution of this identification process within a single case study and with the help of futuristic scenarios has not been performed yet to the investigator its knowledge. Therefore, the study tests a methodological matter in identifying possible path dependencies for a particular enterprise or industry regarding futuristic relevant scenarios. To highlight, the study "tests" the methodological matter in identifying possible path dependencies, because it is not scientifically proven that identifying path dependencies with futuristic scenario's is possible. As a result, the study could contribute to the existing literature on the identification process of path dependence. This contribution could be done in the form of a process in how to identify path dependencies in SME's. Additionally, the study can be seen as an example of how to identify path dependencies with possible futuristic real-world scenarios.

Besides the identification process and the futuristic scenarios, the study also combines the identified path dependencies with already existing theory. This theory is defined by Koch et al. (2009) and Liebowitz and Margolis (1995). Whereby, the theory of Koch et al. (2009) is used to relate the identified possible dependency to the phase the dependency finds itself within the path dependency process. Additionally, the theory of Liebowitz and Margolis is used to relate the identified dependency to an inefficiency degree and the costs associated when choosing to change the path dependency.

1.3. Outline of the study

Firstly, the main research question is described in this study. Subsequently, the sub-questions which are necessary to answer the main research question are displayed. Thereafter, the theoretical framework of this study is explained. Whereby, every construct within the main research question is explained and the necessary background information is given. This chapter contains a detailed explanation of the concept of path dependence and the path dependency process described in the existing literature. The following section describes the methods which are used in the study. Additionally, the way the data is gathered within the study is noted in this section. Chapter 4 describes the results and findings done within the study. At last, the conclusion, discussion, and implications sections are described.

1.4. Research question

"How is organizational change in the vehicle body building industry limited by path dependencies derived out of environmental influences?"

1.5. Sub-questions

The central research question is divided into 4 sub-questions, to be able to answer the central research question.

1. Which trends are currently developing within the two industries under investigation?
2. Which trends are from importance for enterprises within the vehicle body building industry and the glazier industry?
3. What are the possible futuristic environmental influences regarding the two industries under investigation?
4. How can the pre-defined environmental influences limit enterprises within the vehicle body building industry?

2. Theoretical framework

The main goal of this chapter is to describe all the theory and concepts related to this study. The main three constructs of this study are defined in the previous chapter. Subsequently, it is necessary to describe the underlying theory of these three constructs and how they are related to each other. Also, other theories which can be related to the study its main objective "path dependence" must be investigated too.

At first, the constructs within the research question are explained. These constructs are path dependence, environmental influences, and organizational change. Next to this, the relationship between environmental influences and organizational change will be discussed. Thereafter, the concept of rigidity is described because of its similarities too path dependence. This must be done to clarify the differences between path dependence and rigidities. In the end, this section gives an additional theory about the relationship between environmental influences and organizational change. Additionally, bias about similar or related concepts towards path dependence are clarified and therefore differences or overlapping areas can be highlighted. The visualization of the theoretical framework used in this study is displayed in Appendix 1.

2.1. Explanation of constructs in research question

In the research question are multiple key constructs which need more explanation to have a better understanding of them. These constructs are path dependency, environmental influence, and organizational change. The following paragraphs will define, describe, and explain these constructs.

2.1.1. Path dependence

Path dependence is a concept which was designated as a cause-consequence indicator by Arrow (1963) within the perspective of social choice and individual values. Nowadays, the term path dependence refers to multiple topics in the field of academic research, namely economics, social, and physics. Whereby, the economic and social studies are pretty in line with each other concerning the definition of the construct. Both studies contain two similar descriptions of path dependency, the following paragraphs will describe both. Firstly, a more general view on path dependence is described. Secondly, the more widened and narrowed concept of path dependence is explained.

The general version of the term path dependence can be explained be Sewer (1996) who states that "what has happened at an earlier point in time will affect the possible outcomes of a sequence of events occurring at a later point in time" (p 262). Whereby, this citation can be summarized in only two words, namely "history matters" (Collier and Collier, 1991). Wherein in this study, the history of the enterprise will most likely realize path dependencies towards the possible futuristic scenarios. This is the most generalized and shortest definition which can be referred to the construct path dependency in general and regarding the enterprise.

In contrary to the short and generalized definition stated above, there is a lot of research done to a more explanatory description of path dependence. As a consequence, a more explanatory description can be defined as differences in outcome that are the result of decisions in the past, in the form of a strong reinforcing process, which might result in an ''historical hang-over'', limiting organizational changes in the future. (Bouckeart and De Geest, 2001; Sygow et al., 2009; Sewer, 1996). For clarification, the best-known example of path dependence can be described with the help of the QWERTY keyboard. Whereby, David (1985) described that the introduction of the QWERTY keyboard is an example of path dependence regarding the first-to-market introduction. Thereby, David (1985) notifies the QWERTY keyboard has developed a certain legacy which is still used in computers and other technology devices today.

Within this study, the explanatory and more narrowed definition of path dependency is used. There is chosen to use this definition because of its less-generalized vision and its more explaining power towards the "futuristic" analyzed phenomena. In addition to the definition of path dependency, the process can be described also. This process is, just like the definition, investigated by many researchers. Therefore, the next paragraphs will be used to explain the different processes in a detailed summarization.

Researcher	Year	How to define path dependency process	PD regarding
Sheikh and Zafar Iqbal Jadoon	2011	1 - Critical juncture 2 - Reproduction 3 - Critical junture or punctuated equilibrium	General
Vergne and Durand	2010	1 - Very weak initial conditions 2 - "contingent" or chance events 3 - Self-reinforcing mechanisms 4 - Lock in	Economics
Sydow et al.,	2009	1 - Preformation phase 2 -Formation phase 3 - Lockin phase	Economics
Mahoney	2000	1 - Only early events in sequence matter 2 - These early events are contingen 3 - Later events are inertial	Sociology

Table 1: summarization of studies done regarding dependency process

Overall, all the studies (Sydow et al., 2009; Mahoney, 2000; Sheikh and Zafar Iqbal Jadoon, 2011; Vergne and Durand, 2010) describe in broad lines the same process for identifying path dependence. Therefore, it can be concluded that there is no difference in the process of identifying path dependence. As a result, the path dependence process defined by Sydow et al., (2009) is used in this study. The following paragraphs are used to clarify each phase within the process according to the findings done by Sydow et al., (2009).

Phase 1 – the preformation phase

This phase is characterized as by the broad scope of actions, or in other words, the multiple options an enterprise has towards a certain activity. As can be seen within the visualization, there are relevant and irrelevant options. Eventually, enteprises chooses one of the relevant options and continues to phase 2. As a notification, this phase has the condition that the choice which is made cannot be fully predicted for futuristic outcomes. Sygow et al., (2009) describes that this choice may set off a self-reinforcing process, whereby he refers to the moment of starting this process as a critical juncture. In the end, this critical juncture is an indicator for the end of the preformation phase and the beginning of the formation phase.

Phase 2 – the formation phase

The self-reinforcing process introduced within phase 1 reinforces itself only more when time passes by. As a result, this process is creating a more and more dominant action pattern which is hard to reverse. As a consequence of this dominant action pattern, the number of options is reducing also. Within the formation phase, the futuristic pattern of the historical choice is almost fully converted to a fixed pattern which is irreversible. This fixed pattern will occur in phase 3.

Phase 3 – the lock-in phase

At last, the lock-in phase can be described as an irreversible pattern developed by the self-reinforcing process. This process is the result of the option chosen in phase 1, whereby this choice has such a strong self-reinforcing effect that it erases all the alternative options. As a result of erasing these options, the process has now developed a fixed pattern which cannot be reversed. Therefore, enterprise are dependent on the choice they have made in the past. Besides, enterprises could lose some of their flexibility due to the dependency on the new activity.

In the end, the outcomes of the path dependence can be interpreted to the findings done by Liebowitz and Margolis (1995). They defined three different levels of path dependence, whereby each degree contains its unique characteristics. The following paragraphs are used to describe the three different degrees of path dependence.

First-degree of path dependence

Initial actions are the result of a certain path which must be followed, but this path happens to be the most optimal one. As a result, enterprises are not harmed. In short, first-degree path dependences are according to Liebowitz and Margolis (1995) "instances in which sensitivity to starting points exists but has no implied inefficiency" (p.207).

Second-degree of path dependence

Is described as the possibility that efficient decisions may not be as efficient afterward. Within this degree, it is characterized that the chosen path cannot be predicted for futuristic outcomes. Furthermore, this chosen path is later characterized as inefficient regarding an alternative path. Therefore, the main difference between first- and second-degree is that within first-degree the chosen path is the most optimal scenario, in contrary to the second degree which is inefficient. Also mentionable is that this type of path dependency is not fully inefficient. Liebowitz and Margolis (1995) describe that there are certain limitations towards knowledge. Whereby they mean, that a later state of knowledge could indicate better outcomes.

Third-degree of path dependence

Third-degree path dependence can be described as a process which cannot be influenced. Whereby, Liebowitz and Margolis (1995) indicate that the path dependency process on its own leads to an inefficient error, for instance, market failure. Also, Gigante (2016) mentions that "the outcome of the process cannot be predicted and switching from one arrangement to the other is significantly costly" (p. 6).

Eventually, the identified path dependencies within the SME could be allocated to the different degrees found by Liebowitz and Margolis (1995).

2.1.2. Environmental influences

Additionally to path dependence, it is important to clarify what environmental influences are and what their impact can be on enterprises. Next to this, it is necessary to describe the types of environmental influences in a more general description. These general descriptions can be found in paragraph 3.2.1. The automotive industry and 3.2.2. The flat-glass and glazing industry. To start, environmental influence can be divided into five different environmental dynamisms according to Suarez and Oliva (2005). These environmental influences are regular-, hyper turbulence-, specific shock-, disruptive-, and avalanche environmental influence. In addition, they mention that all these types of environmental dynamisms are affected by four different variables. For clarification, a table with all these types of environmental influence and the power of the four different key variables on these influences is noted in Table 2 below. In the following paragraphs, these concepts of environmental change will briefly be discussed.

At first, Saebi (2015) refers to regular environmental change as "fairly stable environments that experience low-intensity gradual changes" (p. 13). As a result, it can be stated that enterprises within this type of environment are not that dependent on environmental change. In addition, Suarez & Oliva (2005) discuss that regular environmental changes go hand in hand with specific shocks or disruptive changes.

Secondly, hyper turbulence corresponds to an environment where new dynamics have altered the industry pace and imposed on firms the need to take new and frequent steps to adapt to the fast-changing conditions (Suarez & Oliva, 2005). In addition, D'aveni (1994) labels this type of

environmental change as “hyper competition” because the new dynamics are most of the time implemented or founded by competitors.

Thirdly, specific-shock change is described by Suarez & Oliva (2005) as “environmental changes that are rapid and high in intensity, come rarely and are relatively narrow in scope.” (p. 1023). For instance, a typical example would be industry deregulation by governmental institutions.

Fourthly, disruptive change can be referred to with the introduction of disruptive technologies. These disruptive technologies often require new knowledge or skills and tend to go unnoticed by industry incumbents for a while (Christensen, 2009). A good example of disruptive change will be the worldwide known photography company Kodak. Whereby, the company did not or was not able to respond to the changing environment in a technological aspect. This was at the time that this industry was evolving from paper and film made photo’s to digital photo’s (Lucas and Goh, 2009).

At last, avalanche change is referred to as the change with the most impact on enterprises within its environment (Suarez & Oliva, 2005). In addition, they mention that this type of environmental changes are infrequently, but with high speed and intensity. An example is “the implementation of profound economic reforms in developing economies and former Soviet-style countries” (p. 1023).

To summarize, five different environmental influences and their impact regarding an enterprise are stated. These five environmental influences are used within the study to describe the kind of influence an SME could be facing and to indicate the amount of power it can exercise. Therefore, every environmental change described above can be associated with a specific pattern towards organizational change.

Frequency	Amplitude	Speed	Scope	Type of environmental change
Low	Low	Low	Low	Regular
High	Low	High	Low	Hyperturbulence
Low	High	High	Low	Specific shock
Low	High	Low	Low	Disruptive
Low	High	High	High	Avalanche

Table 2: Different types of environmental change and their key variables

2.1.3. Organizational change

At last, organizational change is a construct which needs more clarification. There are two types of organizational change which must be explained, namely planned- and unplanned organizational change. Therefore, both organizational changes must be considered in this study. The difference between both concepts is described by Bridges (1986) as organizational change and organizational transition, whereby the planned change is associated with organizational change and unplanned change with the organizational transition. The following paragraphs will clarify the difference between planned- and unplanned organizational change.

Planned organizational change can be referred to as the three-step approach found by Lewin (1947a). This approach indicates that a successful change project involves the following three steps: Unfreezing, changing, and refreezing. In contrary, the approach found by Lewin has attracted a lot of criticism over the years. This criticism is a consequence of Lewin ignoring a lot of different forces which affect the ability to change organizationally (Burnes, 2004). In addition to Lewin, Battilana et al, (2010) mention that the skills and knowledge of the manager or CEO regarding the emotional reactions of those involved within the change process are one of the key determinants for successful planned organizational change. In addition, they describe that the hardest challenges are within this process are the “way to explain why the change is needed, and to discuss the nature of the change and thereby

reduce organization members' confusion and uncertainty" (p. 424). As a generalization, planned organizational change can be seen as the drive to change organizationally from an entrepreneur's perspective. Whereby, it is most likely that these changes are the result of internal factors or external factors which are discovered at an early phase. Next to this, an enterprise could use planned organizational change, as a result of the recognition of external factors, such as environmental influences, in an early phase.

In contrary to planned organizational change, unplanned organizational change can be referred to as organizational change on which an enterprise cannot anticipate. Enterprises cannot anticipate on these types of events due to their infrequent appearance (Knowles and Saxberg, 1998). Examples of these types of events are an economic crisis, deregulations, new technologies, etc. In addition, Jones (2010) describes that due to the many influences of external forces, such as government, consumers, and competitors, enterprises must try to be as flexible as possible towards these influences. As a result, enterprises can adapt more easily when events occur which influences these enterprises. In short, unplanned organizational change is defined in this study as the need for organizational change which is driven by infrequent events where an enterprise cannot anticipate on.

To conclude, the study focuses on unplanned organizational change. There is chosen for unplanned organizational change as a result of the futuristic scenarios being infrequent. As a result of this infrequency, enterprises are currently not anticipated on these types of influences. However, as a result of this study, enterprises could choose to anticipate on the described possible path dependencies because of the environmental influence its relevancy of happening in the future. Wherein, the enterprises transform the unplanned organizational change to a little more planned organizational change, as a result of having insights in possible path dependencies on certain relevant environmental influences.

2.2. The relationship between environmental influences and organizational change

The relationship between environmental influences and organizational change can be compared to the resilience theory (van Breda, 2018). Basically, this theory describes that enterprises are confronted with unexpected and gradual changes in their operating industry which they must overcome. Eventually, the enterprises will be more resourceful and stronger when they overcome these forces (Carli et al., 2012). This theory is also supported by the statement of Damanpour and Gopalakrishnan (1998) who state that "Organizations as open systems seek a state of equilibrium with their environments; therefore, they change their strategies, structures, and processes in response to and in coordination with the changes in the external environment. This organization–environment adaptation is viewed by contingency theorists as a necessary condition for organizational effectiveness" (p. 11). Whereby, the process on the whole from environmental influences pushing an enterprise too organizational change can be reflected to the resilience theory.

Next to this, the rapidity and obligation to change differs a lot. This is a result of the different types of organizational change and different level of environmental influences described in the previous sections. Furthermore, the relationship between environmental influences and organizational change contains some more mentionable factors.

To start, Baldridge and Burnham (1975) note that size and complexity are key factors in the process of organizational change. Additionally, they mention that if an enterprise increases in size it also increases in complexity. This statement is in line with the findings done by Sydow et al,. (2009) who also not that enterprises become "hyperstable" when they are getting older and grow in size. As a result, it can be concluded that when an enterprise its complexity to organizationally change increases when it is aging and/or growing in size.

Secondly, Tidd (2017) mentions that networks are key factors within the relationship between environmental influences and organizational change. Whereby, he describes the benefits of these networks in the form of co-specialization, sharing of joint infrastructure and other network externalities. As a result of these co-operations, the cost of purchasing new technology or developing it on your own is out weighted. On the other hand, Gulati (1998) describes that there are multiple

limiting aspects regarding freedom of the enterprises when certain networks or alliances are formed. Therefore, forming a certain network or alliances will not always be the best solution.

At last, Gordon (1991) investigated that enterprises are mostly affected by the characteristics of their own industry. Therefore, this statement is strengthening this study, which also focuses on two industries which are affecting enterprises within the vehicle body building industry. These industries are explained in section 3.2 “Background of the environmental influences”. Furthermore, Gordon (1991) suggests that enterprises which operate in industries which are affected by multiple organizations must be more flexible towards organizational change that one who does not. This concept of flexibility is the main objective of the main construct within this study, path dependence.

To sum up, there are multiple key aspects within the relationship between environmental influences and organizational. Therefore, the opinion about which one is the most important differs from one researcher to another. The researchers mentioned above described size, complexity, age, networks and alliances, and flexibility are the most important factors when organizational change occurs due to environmental influences. Whereby, all these factors can be linked to path dependence.

2.3. Brief comparison to related concept of path dependence

The following section is defining the concept of rigidities which is almost similar to path dependence and could also be related to organizational change by environmental influences. Therefore, the main goal is to describe both, the similarity of the concept and the eventual difference too path dependence.

2.3.1. Core rigidities

Core rigidities are the flipside of core capabilities, whereby according to Leonard (1992) rigidities are limiting regarding development or organizational change. Therefore, the concept of core rigidities is relevant for this study and must be compared to path dependence to dismiss any confusion. The following paragraphs are designated to define the concept of core rigidities. Eventually, a short description of the difference between core rigidities and path dependence is noted.

Butler and Pyke (2003) discuss CC is “a knowledge set that distinguishes and provides a competitive advantage” (p.4). Consequently, enterprises will use this “competitive advantage” to stay ahead of their competitors. Therefore, the enterprises do not have to change organizationally due to this competitive advantage. On the other hand, their competitors must determine if they are going to change because otherwise, they will be ahead of others. In addition, Vickors and Koch (1995) describe CC as the development of realization of value to customers or other stakeholders. Therefore, the opinions of people who are externally related to the enterprises are also important.

As described before, the flipside of CC is CR. Whereby CC’s could develop into CR’s when time passes by (Abetti, 1996; Lei, 2000; Leonard, 1992). In addition, Hacklin et al. (2009) mention that core rigidities, especially within the innovation process, are related to knowledge management. Therefore, knowledge management is according to them a key factor in creating new “creative” activities and efficient development. Next to this, core rigidities could be the result of attracting too little “new” knowledge to enterprises. Therefore, it could be that there is enough knowledge within these enterprises, but this knowledge is not used in the most efficient way possible.

A comparison between core rigidities and path dependence can be done based on the founding’s of Koch et al., (2008). They describe that there is a relationship between core rigidity and path dependence. Whereby, this relationship is the interplay between the key aspects of path dependence often refer to a rigid character of core competencies and capabilities. As a clarification, it is described that core competencies or capabilities can develop over time into core rigidities (Leonard, 1992; Miller, 1993). In addition, they describe the character of this rigidity as the side effect of inertia, which can be described according to Miller (1993) as the resistance of an enterprise to change organizationally.

Additionally to Koch (2008), Leonard (1992), and Miller (1993), Assche et al., (2011) relate path dependence to core rigidities from a flexibility perspective. As an example, they describe that choices

in the past are affecting the possibilities in the future. Therefore, it could be that path dependence has a limiting effect on organizational change. Consequently, due to the limiting effect path dependence can be seen as a core rigidity.

To summarize, path dependency can be seen as a core rigidity due to its often-rigid character. Additionally, the path dependence process described by Koch et al., (2008) can be seen as a preliminary phase before the emergence of a core rigidity. Whereby, this description is in line with the statement of Leonard (1992) who says that capabilities could develop into rigidities as time is passing by. Therefore, it can be concluded that even a path dependence degree of level 1 described by Liebowitz and Margolis (1995) could develop in a core rigidity when time is passing by. To highlight, there is chosen for the construct of path dependence as a result of core rigidities are often bound to a "sleeping" management, which makes the processes age instead of improving them. This statement is similar to the statement of Leonard (1992) which described that core rigidities could develop in core rigidities when time is passing by. In contrary, the construct of path dependence gives a more explanatory view of the creation of the problem, it indicates the source of the problem. In other words, it describes by which decision the dependency towards a certain path was created.

3. Methodology

The research process and data analysis are explained in this section. At first, the research context is presented. This context includes the origin of the thesis and some background on the SME under investigation. Secondly, the research design is described. The main goal of this design is to explain the aim of this study and how this study is going to investigate its main objectives. Thirdly, the participants within the semi-structured interviews are briefly discussed. In addition, the main objective of the semi-structured interviews is explained. Fourthly, the participants within the focus groups and the main goal of the focus group is explained. Thereafter, the section data collection explains how the data is gathered and which supportive tools have been used. At last, a brief description of how the gathered data is analyzed is explained.

3.1. Research Context

The main goal of the chapter research context is to describe the origin of the study. Subsequently, the chapter contains a section which describes necessary background information about the industries within the vehicle body building industry. In the end, this chapter is designated to explain why the study is done regarding the SME under investigation and the CEO.

3.1.1. Origin of the study

The origin of this study can be linked to the urge of the CEO of the enterprise to have insights into the flexibility and dependency of the enterprise within their operating activities to change organizationally when environmental influences occur. The CEO mentioned that the enterprise experiences changes within two of their operating industry. Therefore, the CEO wants to investigate if the enterprise could change its current business plan if these changes occur in the future.

3.2. Background of the environmental influences

This study is mainly focused on two different industries which can be related to enterprises in the vehicle body building industry. These industries are the automotive industry and the flat-glass & glazing industry. These two industries are chosen because of their importance for the vehicle body building industry and for the enterprise under investigation according to the CEO. Whereby, the automotive industry is important for all enterprises within the vehicle body building industry. Additionally, the flat-glass & glazing industry is chosen to investigate by the CEO because of the focus of certain enterprises in the vehicle body building industry on this industry.

This study makes use of relevant scenarios in both industries. These scenarios are derived out of reliable sources or acknowledged professionals, these sources are discussed in the next sections.

Still, it cannot be said for 100% that these scenarios will occur in the future. These scenarios are used in the semi-structured interviews and focus groups as a predictive event which may result in organizational changes in the future. Subsequently, it is necessary to clarify both industries its backgrounds to improve the reader its knowledge of these industries. As a result, the following sections give insights in both industries its history and discusses briefly the origin of the possible changes or modifications within this industry which can occur.

3.2.1. Automotive industry

Through the years the automotive industry experienced a lot of change. In addition, the outlook for the coming years is indicating more changes and modifications as well. These possible changes or modifications are briefly described within the scenarios which are displayed in this section. The following paragraphs its main goals are introducing the industry and describing the origin of the futuristic modifications or changes.

The automotive industry that produced automobiles which we are familiar to today was established in 1906 by Henry Ford. Ford introduced the assembly line in 1913 to the world and thereby the mass-production of automobiles. Subsequently, most developments in this industry were in the field of convenience, safety, ecological, and design. (e.g. automatic transmission, 1939; air conditioning, 1940; seat belts, 1968; airbags, 1970's; hybrids, 1990's; smart cars; 2000's)[1]. Therefore, it can be said that this industry undertook a lot of changes and developments overtime.

As mentioned before, there is a reasonable chance that the industry is going to undertake a lot of changes and developments in the future as well. Therefore, this study uses scenarios which are reasonable to occur within the automotive industry in the future. These scenarios are described in the following paragraphs and are based upon articles and journals written by market-research organizations and researchers who investigated these scenarios. Consequently, table 3 displayed underneath contains the resources used for the scenarios regarding the automotive industry. These sources described multiple futuristic scenarios for the automotive industry. However, not all these scenarios were relevant for enterprises in the vehicle bodybuilding industry. As a result, only the futuristic scenarios which were indicated by multiple sources and who were relevant for enterprises in the industry were used. This resulted in two relevant scenarios which are relevant for enterprises in the industry, which are most likely to going to happen in the future, and are indicated by multiple sources. These two scenarios are described in the following paragraphs.

Subsequently, the following paragraphs are destinated to explain the chosen scenarios which

Source	Year	Description
PWC	2018	Reproting the five biggest trends within the automotive industry
McKinsey	2016	Describing how the automotive industry would look like in 2050
Continental	2016	Investigating the possibilities in autonomous driving
Cetim engineering	2016	Describing the five main goals where the automotive industry is aiming on
Intellias	2019	Investigating the latest and futuristic technologies in the automotive industry
Delloite	2018	Studying a reality check on advanced vehicle technologies

Table 3: Sources used to describe the futuristic scenarios within the automotive industry

are described in the results. To clarify, there is chosen to use only four out of the ten scenarios. This is a result of some of the scenarios being not abstract enough and therefore, providing not the data necessary to describe relevant results. As a result, the scenarios described underneath provided relevant data and are more significant for enterprises within the vehicle body building industry.

The first scenario which is highlighted in the results is scenario 1. This scenario describes that the engine of vehicles is going to change from a fuel-powered engine to an electric one (PWC, 2018; McKinsey, 2016; Delloite, 2018; NBTC, 2019). Whereby, Delloite (2018) mentions that "many global auto consumers remain uncertain about self-driving cars, any reprieve offered by popular attitudes, government policy, or low fuel prices is likely to be little more than a speed bump on the way to a more

[1] Retrieved from: https://www.cebos.com/blog/milestones-automotive-manufacturing/

electric, autonomous, and shared future vehicle fleet" (p. 4). This indicates that there is a high possibility in the future of vehicles being electronically powered. Additionally, the same statement made by Delloite (2018) indicates vehicles driving autonomously in the future. Besides the statement made by Delloite (2018), other similar organizations support their opinion. For instance, McKinsey (2018) states that "electrified vehicles are becoming viable and competitive; however, the speed of their adoption will vary strongly at the local level" (p. 12). Whereby, they forecast one main problem in the adaption process at a more local level.

Additionally, the second scenario is already mentioned in the previous paragraph. This scenario indicates that vehicles will be driven autonomously in the future (Mckinsey, 2016; Delloite, 2018). Whereby, Delloite (2018) describes that there are two major bumps regarding the implementation of autonomous driving. These problems are within the perspective of trust and safety towards the consumer. Wherein, the end consumer needs to trust the vehicle produce regarding insurance towards their safety. However, both Delloite (2018) and McKinsey (2016) believe that the future in the automobility industry contains the aspect of autonomous driving vehicles.

3.2.2. The flat-glass and glazing industry

The flat-glass and glazing industry is considered within this study as a result of the major dependency on this industry by several enterprises in the vehicle body building industry. As already mentioned within section "3.1.1 Enterprise under investigation" the products of the company are from origin destinated for this industry. Notifiable for this study is that the product developments around glass as a product are not interesting to consider. This is a consequence of the enterprises in the industry their contact points with the industry, which are the working methods and the transportation of the flat-glass. Additionally, the keywords that are involved with this industry regarding the enterprises are safety, efficiency, and stability. Therefore, the scenarios derived out of these sources are also based upon these keywords. At last, this study makes use of only four main sources because other papers were outdated or not relevant because they only described glass production trends or developments. These sources are displayed and described in the next paragraphs. Additionally, the following paragraphs are used to clarify the two scenarios derived out of the glass and glazing industry, wherefrom the results are described in the results section. Next to this, similar to the automotive industry situations, these sources indicated more than two scenarios which could occur in the future. Aside from this, within this study, only the two situations are used which are highlighted by multiple sources and which were relevant for enterprises in the vehicle body building industry.

Researcher	Year	Description
Siemens	2018	Report of a global player in the flat glass industry of the coming trends and developments
National Glass Association	2017	Magazine of one of the biggest glass associations about futuristic trends and changes
ILO Geneva	2016	Report of the different trends and changes in different countries regarding glass
Pilkington	2010	Report of a global player in the flat glass industry of the coming trends and developments

Table 4: Sources used to describe the futuristic scenarios for the flat-glass and glazing industry

To start, both scenarios within the field of the glass and glazing industry can be linked to law and regulation. The first scenario describes that building elements such as glass have to be covered when they are transported externally. This scenario derives out of traffic safety regulations described by several glass and glazing organizations (NGA, 2017; GGF, 2016). Whereby, both glass organizations GGF and NGA describe that safety for individuals within the traffic and the driver itself must be guaranteed. This safety is mostly linked to the dangerous aspects of transporting glass, such as the glass fragments and splinters which can occur when an accident happens. Therefore, there is a high probability there will be regulations regarding the coverage of glass when transported.

Additionally, to the coverage of the glass, there could also be a new regulation towards vehicle equipment. At the moment, there are two types of vehicle equipment, certified and uncertified vehicle equipment. Whereby, the certified vehicle equipment can be subjected to the ISO 9001 certification[2]. However, the European Transport Safety Council (ETSC, 2014) indicated that "in 50% of all driving collisions caused by vans, the vehicle had been in an unstable condition before the collision (p. 21). Whereby, these unstable conditions can be linked to the usage of uncertified vehicle equipment. Therefore, these organizations plead for the usage of only certified vehicle equipment to reduce the number of driving collisions of vans. As a result of these organizations being governmental institutions, there is a reasonable chance that this scenario could occur.

3.3. Research design

This study aims to describe the limiting effects on organizational change for enterprises within the vehicle body building industry derived out of futuristic path dependencies. Additionally, the study tries to add theoretical contribution within a methodological perspective towards investigating path dependence in a single-case study with the help of futuristic scenarios. Furthermore, this study can be seen as some kind of test which tests the hypothesis of Garud et al., (2010). They describe that futuristic path dependencies, "path creation", can be found with the help of relevant situations (scenario's) and actors (the participants). This methodological perspective is based on a qualitative research design which contains both, semi-structured interviews and focus group sessions.

3.4. Participants in semi-structured interviews and focus groups

The participants within the semi-structured interviews are employees which contain above average experience and knowledge within the enterprise. Additionally, they are familiar with both industries under investigation. It is from importance to perform semi-structured interviews on these employees to gather deeper insights about the path dependencies towards the already described futuristic scenarios. In addition, the content of the semi-structured interviews does not differ from the focus groups. These futuristic scenarios are comprehensively described in the results before the possible path dependencies derived out of the participants are noted.

Eventually, when the data from the semi-structured interviews are gathered, all the participants will also join a focus group. The importance of this focus group derives from the knowledge and experience of these interviewees. This focus group will be held because of the possible "new path dependencies" which could be detected when the participants join a session together. Next to this, these participants must join a focus group together because they could affect the other participants within the other focus group sessions with their knowledge and experience. Therefore, this knowledge and experience could inhibit the thoughts about the path dependencies of employees who are less knowledgeable and experienced. At last, these participants are described in table 4.

[2] https://www.bottltd.co.uk/downloads-vehicle-conversions/8-bott-vario-brochure/file

Next to the semi-structured interviews, focus groups are used within this study to gather data of the employees who have less experience and knowledge about the industry and enterprise. These employees are joining a focus group because it is too time-consuming to interview every single one of them. At last, the key persons, managers, who are already interviewed joined a focus group altogether. This is done because together they could come up with "new problems" or "path dependencies" regarding the described futuristic scenarios. However, the researcher must try to prevent bias regarding a hierarchy perspective (Morgan, 1997). As an example, there is a reasonable chance that employees agree faster with the CEO instead of a manager or co-worker. Therefore, the CEO did not attend this focus group. As a result, all the participants had similar responsibilities within the enterprise and the chance on hierarchy biases are minimized. A comprehensive overview of all the interviewees and focus groups is displayed below in table 5 and 6.

Participant	Division	Function	Contact
Manager 1	Sales	Responsible for important customers and monitoring thesales department	Face-to-face
Manager 2	Engineering	Monitoring the engineering employees and supporting them	Face-to-face
Manager 3	Production	Responsible for the production of all the products ordered and the ambiance on the working floor	Face-to-face
Manager 4	Marketing	Supporting the sales department with promoting material, data, and online campaigns	Face-to-face
Manager 5	Financial	Monitoring all financial aspects within the enterprise and responsible for the provision of financial documents	Face-to-face

Table 5: description of all participants within semi-structured interviews

Participant	Division	Function	Contact
Focus group 1	Production 1	Installing the produced products on vehicles of customers	Group session
Focus group 2	Production 2	Producing the products for production team 1	Group session
Focus group 3	Sales DE	Responsible for the sales in geographic locations of Germany, Austria, and Switzerland	Group session
Focus group 4	Sales NL	Responsible for the sales in geographic locations of the Netherlands and Belgium	Group session
Focus group 5	Engineering	Responsible for all instruction designs and modifications on the products	Group session
Focus group 6	Key persons	Decision making persones withing the organization	Group session

Table 6: description of all participants participating within the focus groups

3.5. Data collection

There are three different manners of data collection within this study. These manners are a literature study, semi-structured interviews, and focus group sessions. The main purpose of the following paragraphs is to describe why a particular form of data collection is used and what the key aspects of these particular manners are.

3.5.1. Literature study

The literature study is necessary to perceive a certain level of knowledge about the different constructs within the study. Furthermore, this knowledge is necessary within the following processes in the investigation, such as the interviews and focus group sessions. Within the interviews and focus groups, this knowledge is utilized in the form of questions towards the participants. In other words, this knowledge is used to ask the right questions towards the participants to gather useful data to answer the research question. In addition to the knowledge which must be gathered by the investigator, it is for the reader important to reach the same level of knowledge to understand and interpreted the study.

3.5.2. Semi-structured interviews

The semi-structured interviews are used to gather data from the most knowledgeable and experienced employees. Therefore, according to Morgan (1997), these semi-structured interviews can be seen as "key informant interviews", whereby the interviews are supporting the data and giving the investigator deeper insights. As a result, the data derived from these interviews would be more relevant and of a higher quality than the data which is derived out of the focus groups. This knowledge could also be utilized within the focus groups, therefore it is necessary to perform the semi-structured interviews preliminary for the focus groups. Within this study there is chosen to perform both, semi-structured interviews and focus groups, because according to Clifford et al., (2010) the "both allow for an open response from the participants' own words rather than 'yes or no' type of answer" (p. 145).

The semi-structured interviews are recorded via audio recording programs. Additionally, it is from importance to transcribe the interviews as soon as possible. Hearing the taped conversation when it is still fresh in your mind makes the transcription much easier according to Clifford et al. (2010). Next to this, it is necessary to design open-ended questions, since these questions provide the most qualitative information which can be analyzed according to the content methodology designed by Kohlbacher (2006). An example of a questions would be, "how do you think that the described futuristic scenario will affect the enterprise in the future?" or "which problems do you think that derive from the described scenario within the future?". Next to this, high-quality questions can be used in the focus group to start discussions between the participants. However, these questions may not influence the knowledge of the participants about the particular scenario. As a result of the semi-structured interviews, it could be that the researcher could ask more high-quality questions towards the participants in the focus groups.

At last, the process of data gathering, analyzing, and reporting is in both types of methodologies, semi-structured interviews, and focus groups, the same (Morgan, 1997). The main difference between the two is the personal contact which is more present within the semi-structured interviews. Next to this, there is a high possibility that a lot of notes must be made during the focus group as a result of the discussions between the participants. Therefore, it is from the high priority that the focus groups are recorded, this way there will not be anything forgotten when transcribing them. As already mentioned, the analyzing and reporting process of both manners is the same following the guidelines of Kohlbacher 2006. These guidelines and the way the data is analyzed and reported is explained in section 3.5.3 Focus groups and 3.6 Data analysis.

3.5.3. Focus groups

The focus groups in this study are designed regarding the literature found by Morgan (1997), and Frey and Fontana (1991). Whereby, Frey and Fontana (1991) describe in which situations focus groups can be useful and Morgan (1997) explains an explanatory process which can be described in four different phases namely planning, observation, analysis, and reporting. The following paragraphs will shortly describe how the focus groups will be following the guidelines developed by Frey and Fontana (1993) and the process described by Morgan (1997) within this study.

At first, the planning is made, and the different focus groups are described. This planning contains the division and the function of the participants within a particular focus group. These groups are separated pro division because these participants are familiar in working with each other. This way it is more reasonable that the participants will formulate and discuss the problems more easily. On the other hand, if employees from multiple divisions join a group session the discussions will derive from more various perspectives and opinions (Frey and Fontana, 1991). Therefore, all the managers within the enterprise who joined a semi-structured interview will also join a focus group together. The planning of the focus groups is located in table 5 in section 3.4.

Secondly, observation is described by Morgan (1997) as the manner how the researcher is designing the focus group. In this study, the focus groups will be held with audio and visual support. The visual support will be in the field of a presentation, whereby videos and images will be necessary for clarification purposes. Next to this, the focus group is recorded with the help of audio-recording tools. The focus group is recorded for the next phase in the process, which is analysis. Whereby, the record its purpose is to make sure that nothing is forgotten by the investigator after the focus group (Frey and Fontana (1991). Additionally, the investigator makes notifications during the focus group. These notifications will be helpful when writing the reports (Miles and Huberman, 1994)

Thirdly, analysis is noted within the focus group process. During the focus groups, several relevant futuristic scenarios are discussed within multiple groups out of multiple divisions. Next to this, the starting point of the analysis can be described by the literature written by Rixen and Viola (2009). They describe path dependence as a mechanism which can be seen as a link between cause and effect. Whereby, in this study the causes are already known. These are the scenarios for the two different industries. However, the effects of these causes within the perspective of path dependence is the big question mark within this study. The predictability of path dependence is hard to determine when it occurs in an early stage. This early stage is described as the preformation phase by Sygow et al. (2009). Subsequently, when the strategical choices are getting smaller the predictability of the path dependence is getting more predictable. For instance, the formation phase is already more predictable regarding the preformation phase. At last, the lock-in phase is the most predictable phase of path dependence. This has everything to do with the fact that there are no more options left and the enterprise is bounded to a certain path dependency (Akyildiz et al., 2012).

Within the analysis, it is from importance to discuss how the quotes and citations can be linked to the process found by Sydow et al. (2009). This is a result of the earlier explained predictability of the path dependencies when a certain situation occurs in the future. The literature of Sydow et al., (2009) and Lerch (2009) are leading within the analysis phase in the study. They described that focus groups are for case studies a good match regarding the identifying and discovering the predictability of them. Therefore, Lerch et al., (2010) used a network of 14 organizations who operate within the technology sector. From these organizations, the actors with the most knowledge and experience have been placed in a focus group. On the other hand, Yin (2014) recalls that it is hard to generalize findings from an individual through an embedded case study. However, Lerch et al,. (2009) emphasize that “it is exactly such idiosyncrasies which call for an intensive case study methodology, to explicate the complex processes in path dependence and to develop a basis for further research” (p. 31). In addition, the focus groups are recorded, and notes are being made during the sessions by the investigator. These notes and records are being processed following the guidelines of content analysis especially focused on case studies which are developed by Kohlbacher (2006).

At last the reporting phase is mentioned by Morgan (1997). Whereby, the records and notes gathered within the analysis phase are being developed into results. These results are also written according to the content guidelines of Kohlbacher (2006). As a result, the futuristic scenarios are linked to the discovered problems which could develop in path dependencies in the future. These dependencies are written and supported with quotes and citations which actors described in the focus groups or semi-structured interviews.

3.6. Data analysis

It is necessary to define guidelines in order to gather proper data which is necessary to investigate the research question (Yin, 2014). Therefore, the data collection process within this study can be referred to as a three-stage process. Firstly, it is necessary to have a certain level of knowledge about the constructs within the investigation. As a consequence, several journals, books, and other data are studied in order to perceive this knowledge level. (e.g. Sydow et al., 2009; Leonard, 1992; Mahoney, 2000; Suarez and Oliva, 2005; Knowles and Saxberg, 1995; etc.) These types of secondary data were gathered by searching activities regarding books and journals within databases. Furthermore, these searching activities were based on keywords related to the constructs. Examples of these keywords are "Environmental influence AND path dependence", "Limiting effects of path dependence", "environmental influences AND organizational change", etc. After reading these resources, the relevant information is filtered for the literature review in this study.

Secondly, the explanatory research within this study can be linked to the concept of path dependence which can be described by primary data. Therefore, these primary data is collected through semi-structured interviews and based upon theory described by several studies (Sydow et al., 2009; Liebowitz and Margolis, 1995; Koch, 2008; David, 1985). Whereby, the questions of the semi-structured interview are based on possible futuristic scenarios. There is chosen for futuristic scenarios within this study as a result of the study done by Rialand and Wold (2009). This study describes how futuristic scenarios can define a better basis for strategic decisions in the future. These futuristic scenarios are mainly based on two different environmental influences from two different industries. This is a consequence of enterprises in the industry mainly being affected by two different industries. These industries are the automobile industry and the glazier industry.

The questions asked within the semi-structured interviews are based on the findings done by Bryman and Bell (2015). Whereby, Bryman and Bell (2015) describe that questions asked in a semi-structured interview must be an open question, otherwise you will not conduct the data necessary for qualitative data analysis. As a result, the questions asked in the semi-structured interviews will diminish answers like "yes" or "no", but will provide explanatory content which can be used to identify path dependencies. Eventually, this explanatory content is used in the form of quotes and citations to explain the possible path dependencies.

The sampling selection of the interviewees is not very broad, because of the study being a single-case study. Therefore, it is from importance that the individuals with the most knowledge about the firm and the industry are interviewed. Subsequently, these interviewees their knowledge level is identified based upon their experience, function in the firm, and on responsibilities towards employees. These semi-structured interviews are recorded, and notifications are being made during the interviews, these notifications can be developed into reports after the interviews (Miles and Huberman, 1994).

Thirdly, the focus groups are designed regarding the literature found by Morgan (1997), and Frey and Fontana (1991). Whereby, Frey and Fontana (1993) describe in which situations focus groups can be useful and which conditions they must fulfill. In addition, Morgan (1997) describes focus groups as a process which can be described in four different phases namely, planning, observation, analysis, and reporting. Both, the conditions found by Frey and Fontana (1993) and the process designed by Morgan (1997) are taken into account within this study.

Next to this, the idea of scenarios is supported by Vergne and Durand (2010) they suggest that only simulation, experiments and, counterfactual models are appropriate to study or test path dependence. Additionally, Vergne and Durand (2010) are supported by Garud et al., (2010) who found the concept of path creation. This concept is similar to path dependence however, path creation is based upon situations (scenario's) and constructed on data gathered by actors (participants). As a result, this study uses this method to construct the possible path dependencies regarding an organizational change in the vehicle body building industry. To clarify, the study contains simulation in the form of images and videos which help to clarify the futuristic scenarios to the participant(s). Additionally to Vergne and Durand (2010), Garud et al., (2009) describe that the best way to study or test path dependence is with the help of a case study, although they refer to a historical case study. However, they describe that the participants within the interviews and focus groups will act as actors when they are asked about the scenarios. As a consequence of these actor-roles, the study could use futuristic scenarios towards the participants. Whereby, these futuristic scenarios will be displayed to the participants as a simulation suggested by Vergne and Durand (2010). As a result, this study contains all three, possible futuristic scenarios, semi-structured interviews, and focus groups.

At last, all the choices made are explained in the previous paragraphs, the following paragraphs are used to clarify how the data is reported after it is transcribed. This clarification is done with the help of examples developed by Wenzel (2015) who did a similar study in the funeral industry. The only difference between this study and Wenzel (2015) is that this study is done within multiple organizations in an industry and based upon historical changes. Whereby, this study is a single case study and based upon possible futuristic scenarios.

To start, Wenzel (2015) used semi-structured interviews to gather data from participants who hold multiple positions in the funeral industry. This is similar to this single case study, whereby multiple departments within the enterprise are joining a focus group together or a semi-structured interview. In contrary to futuristic scenarios which are used in this study, Wenzel (2015) used historical events such as an economic crisis. As a result, the outcome of this study is less reliable than the result provided by Wenzel (2015). This is a consequence of the events described by Wenzel (2015) did already happen and the events within this study have a high probability to happen. In addition, the interviewees within the study of Wenzel (2015) do speak about their experiences at that time. The most similar event towards this study within the founding's done by Wenzel (2015) is noted in Appendix 3. Within this section, Wenzel (2015) describes that multiple interviewees highlighted that the industry was changing due to the emergence and rise of the internet. As a result of this event, the golden age of the funeral industry ended, and a new period started. By contrast, the interviewees and actors within this study describe and discuss the problems and possibilities which they think which are most relevant for enterprises in the industry for a particular futuristic scenario.

Subsequently, Wenzel (2015) asked after the historical changes within the industry, whereby the interviewees (experts) describe their experiences at that time. As a result, Wenzel (2015) got results such as quotes or citations which support that a particular historical event found itself in the path dependence process described by Sygow et al., (2009). Within this study, the futuristic scenarios described have a high probability to raise concerns for enterprises in the vehicle body building industry. These concerns could be towards their customers, production, assortment, etc. These concerns can be linked to the concept of path dependence when they are affected by choices made in the past.

4. Results and findings

In this section of the study, the results and findings of the gathered data are discussed. At first, the results and finding derived from the literature study are discussed. Whereby, the main constructs in the research question are described shortly based upon the earlier described information in section 2.1. After the literature study, the results and findings derived from the semi-structured interviews and focus groups are discussed. These results are linked to the futuristic scenario's described in "3.2.1. Automotive industry" and "3.2.2 Glazier industry". Additionally, the possible path dependencies which are found for each scenario are linked to the theory described in the literature study.

4.1. Literature study

There are three different constructs which need to be described before the research question can be answered. These constructs are path dependence, environmental influences and organizational change. Therefore, these constructs are described shortly by the performed literature study.

4.1.1. Path dependence

As described before this study focuses on the explanatory description of path dependence. Therefore, the best fitting description for path dependence within this study would be the differences in outcome that are the result of decisions in the past, in the form of a strong reinforcing process. This strong reinforcing process might result in a "historical hangover", which contains limiting effects towards the opportunities to change organizationally in the future (Bouckeart and De Geest, 2001; Sydow et al., 2009; Sewer, 1996).

Next to the definition of path dependence, the process is described within a three-step process. This process is following the guidelines defined by Sydow et al., (2009). These guidelines indicate the following phases, the preformation-, the formation-, and the lock-in phase. Whereby the preformation phase contains the most strategical options for an enterprise. Within this phase, enterprises do not suffer that much from the reinforcing effects of path dependence. However, after the preformation phase, enterprises could enter the formation phase. This phase contains a more dominant pattern, whereby the strategical options are decreasing regarding the preformation phase (Vergne and Durand, 2010). At last, an enterprise could end up in the lock-in phase. Whereby, the self-reinforcing process of path dependence developed an irreversible pattern which has erased all alternative options (Sheikh and Zafar Iqbal Jadoon, 2011). This reinforcing path dependence process is displayed in Appendix 2.

At last, the possible futuristic path dependencies can be linked to the three degrees of path dependence found by Libowitz and Margolis (1995). Subsequently, these futuristic path dependency scenarios are also allocated to the three different stages defined by Schreyögg and Sydow (2009). And so, in total, the possible path dependencies derived from the interviews and focus groups can be destinated pro scenario to a path dependency degree and the phase within the path dependence process.

4.1.2. Environmental influences

Additionally to path dependence, it is environmental influences which make enterprises want to change organizationally. As a result, relevant futuristic scenarios for both industries, the automotive- and glazier industry, are noted in section "3.2.1. Automotive industry" and "3.2.2. Glazier industry". These possible futuristic scenarios are necessary to identify the possible path dependencies and limiting effects for enterprises in the vehicle body building industry. Subsequently, the literature review 2.1.2. Environmental influences note multiple studies about the concept. Subsequently, this chapter resulted in a comprehensive list which contains four key aspects founded by Suarez and Oliva (2005). Whereby, these aspects are compared to the futuristic scenarios used in this study. As a consequence, conclusions could be made regarding which aspects linked to a scenario are most likely from importance regarding the developments of path dependencies.

Firstly, it is necessary to explain the four key aspects of environmental influences founded by Suarez and Oliva (2005). They described that these aspects are “frequency”, “amplitude”, “speed”, and “scope”. According to them, these aspects can be seen as followed:

“Frequency: the number of times a similar situation can happen per unit of time.”

“Amplitude: the difference between the current situation and the new situation caused by environmental influence.”

“Speed: the rapidity of the impact caused by the influence.”

“Scope: the number of environmental dimensions that are affected by the influence.”

Subsequently, now that the four key aspects of Suarez and Oliva (2005) are defined they can be compared to the four scenarios used in this study. However, as a result of the scenarios being futuristic and not historical, it could be that the power of some of the key aspects cannot be guaranteed to a certain scenario. Therefore, the following paragraphs try to describe the amount of power of the four key aspects according to Suarez and Oliva (2005). Additionally, they provide a definition found by Suarez and Oliva (2005) for all four scenarios.

To start, Suarez and Oliva (2005) describe that there are five different types of environmental change, these types of environmental change are noted in chapter 2.1.2. “Environmental influences”. Next to this, they describe that the influences (scenarios) labeled as “avalanche” and “disruptive” are the most impactful influences to adapt to for enterprises or industries. Whereby, the environmental influence labeled as “avalanche” contains the following powers regarding the four key aspects: a low frequency, high amplitude, high speed, and high scope. In comparison, the environmental influence labeled as “disruptive” contains the same power for the aspects “frequency” and “amplitude”. However, disruptive influences contain a low power of speed and low power of the scope. In contrary to avalanche environmental influences, whereby both aspects are labeled with a high amount of power.

Eventually, the four scenarios can be labeled as “avalanche” environmental influences. As a result of the theory described Suarez and Oliva (2005) and the resources used in sections 3.2.1. “Automotive industry” (Delloite, 2018; PWC, 2018; McKinsey, 2016) and 3.2.2. “Glazier industry” (NGA, 2017; GGF, 2016; ETSC, 2014) However, it is mentionable that the resources used for the automotive industry forecast that the aspect speed is going to be a problem regarding scenario 1 and 2. Wherein, these forecasts contain the implementation time needed for adapting full-electric vehicle and autonomous driving. Additionally, these resources indicate that trust is going to be a problem regarding autonomous driving and its implementation time.

To summarize, the key aspects and the descriptions of the different types of environmental influences founded by Suarez and Oliva (2005) are labeled as significant for this study. Whereby, according to them, this study makes use of “avalanche” environmental influences. These influences are linked to the following amount of powers regarding the four aspects: a low frequency, high amplitude, high speed, and high scope. However, multiple sources who were used to identify the scenarios within the automotive industry indicate that the speed aspect is not going to be high in these scenarios. This is a result of the implementation time needed to win the consumers trust regarding autonomous driving and the time needed to replace the fuel-powered engines by electric ones.

4.1.3. Organizational change

At last, the construct organizational change has been investigated in the literature review. This literature review describes that there are two different types of organizational change, namely planned and unplanned organizational change. Whereby, planned organizational change is defined as the drive to change from an entrepreneurs perspective. This drive derives out of internal or external reasons. Wherein, the internal reason their origin derive out of the entrepreneurs perspective and the external reason by early detected external influences. In contrary to planned organizational change, unplanned organizational change can be seen as a futuristic change where enterprises cannot anticipate. They cannot anticipate on these type of events as a result of the infrequent appearance and unpredictability. As a consequence of the usage of infrequent futuristic scenarios, the study makes use of unplanned organizational change. Therefore, there are still some aspects within the scenarios which are not known for sure, this is a result of the unpredictability of these types of infrequent external influences. (Suarez and Oliva, 2005)

The literature within this study defined unplanned organizational change following the definition of Knowles and Saxberg (1998). They described unplanned organizational change as a certain type of events where enterprises cannot anticipate too. The difficulty in anticipation of these type of events can be linked to their infrequency. Additionally to the definition found by Knowles and Saxberg (1998), Jones (2010) describes some kind of remedy for enterprises towards these types of events. Whereby, he emphasizes that enterprises must try to stay flexible at all times. As a result of this flexibility, enterprises could easily adapt to these rare or infrequent events. To highlight, this flexibility can also be linked to the already discussed resilience theory. Whereby, enterprises use their flexibility to adapt to futuristic external influences, as a result of this flexibility enterprises could adapt more easily.

Eventually, this study tests the power of the key aspects of environmental influences towards their possibilities to change organizationally. For instance, Jones (2010) describes that enterprises have a bigger challenge to change organizationally with events (scenarios) which are infrequent. This hypothesis is tested in the next sections, whereby the path dependencies towards enterprises in the vehicle body building industry are described pro scenario.

4.2. Semi-structured interviews and focus groups

The main goal of this chapter is to describe the identified futuristic dependencies and the limiting effect of these dependencies for enterprises within the vehicle body building industry. These dependencies derived out of citations and quotes which are also noted within this section. The dataset used for this section contains all the participants described in table 5 and table 6 in section 3.4.

Firstly, the futuristic scenario is described within a comprehensive perspective to clarify the origin of the scenario and give the reader more insights. Subsequently, the possible futuristic path dependencies are described. These dependencies are described with the help of citations and quotes. Therefore, this section uses a similar methodological process used by the study of Wenzel (2005). However, there is one major difference, this study uses the theory described by several authors who investigated path dependence in a futuristic way (e.g. Garud et al., 2005; Vergne and Durand, 2005; Koch et al., 2008). Whereby, the study of Wenzel (2005) describes path dependencies based upon historic events. Lastly, the last paragraph of each scenario provides a comprehensive summarization of the possible path dependencies described above.

As described in the previous chapter, the results are based on four relevant scenarios instead of ten. This is a consequence of the level of abstractness and the relevancy for the vehicle body building industry of the derived data out of the other six situations. Whereby, the four scenarios earlier described in "3.2.1. Automotive industry" and "3.2.2. Glazier industry" provided the most usable and insightful data to include in the results. At last, the following paragraphs will contain the results of the four relevant scenarios used in the interviews and focus groups.

4.2.1. Situation 1 – change of fuel powered engines to electric engines within vehicles

The first scenario used in the semi-structured interviews describes a change from fuel-driven engines too electric-driven engines regarding vehicles. Whereby, there is a chance that some vehicles with fuel-driven engines may not enter some cities anymore in the future. These cities try to ban these types of vehicles with the help of law and regulation. As a result, there is a high possibility that enterprises within the vehicle body building industry are affected by this event.

After the scenario was explained to the participants, they came up with possible futuristic path dependencies which will be explained in the following paragraphs. The first identification of a possible path dependency could be identified by the following citation by an interviewee, which identified a problem because of his experience.

"We already did this one time, but during the drive from berlin to us, the customer had to charge the vehicle three times – interviewee 1"

After this citation, it still is not that clear what is meant by the interviewee, however other interviewees supported him and gave a more clearer citation about the possible dependency. For instance, one interviewee describes the possible dependency as followed:

"There will be a problem regarding the transport of the vehicles, as a result of their action radius it is hard to cover long distances. Additionally, the extra weight added by our products will result in a lower action radius – interviewee 3"

To clarify, the citation of the interviewee gives better insights into why the action radius is providing path dependencies for vehicle body building industry. Whereby, the action radius only decreases, since the vehicle body building industry most of the time adds weight to vehicles. However, out of the interviews derived that not only weight is a problem towards the action radius of the vehicles. Additionally to the weight of the products, another interviewee identified that the wind resistance of the products will also have an impact on the action radius of the vehicles.

"Additionally to the weight, the action radius of the vehicles will also decrease due to their wind resistance. Whereby, the lower the wind resistance, the lower the action radius will be – interviewee 1"

As a result of the citations and quotes described above, the interviewees defined multiple possible dependencies towards one crucial aspect of the situation. They describe that the aspects of weight and wind resistance of the products are moderating factors within a negative perspective towards the biggest possible dependency "action radius". Whereby, the more weight is added and the lower the wind resistance of the products, the lower the action radius is going to be.

In addition to the possible dependency regarding action radius, the participants within the interviews and focus groups identified several other possible dependencies. Whereby, the participants again developed a path dependency towards the weight, however this time the weight of the battery could affect the loading capacity of the vehicle. This possible dependency can be noted as a result of the following citation.

"There is a reasonable chance that the weight of the battery itself will limit the vehicle regarding their maximum loading capacity – interviewee 2"

Subsequently, it can be concluded that the participants identified two possible path dependencies within the perspective of weight. Wherein, one possible weight dependency is in the form of action radius and the other in the field of the loading capacity of the vehicle. Furthermore, the participants described another possible dependency. This dependency derived out of previous experiences of the participants regarding finding a fitting solution. This possible dependency is on an internal department which is needed by every similar enterprise within the vehicle body building industry.

"We are dependable regarding our engineering department, they are the ones who have to come up with new products and ideas – interviewee 4"

As already described in the citation, the participants described that when problems occur regarding material or design the problem is allocated to the engineering department. As a consequence, a possible dependency on the engineering department could occur. These solutions will most likely be in the form of lighter material to increase the action radius. This can be assumed by the discussions in the focus groups, whereby they mentioned:

"The engineering department should develop a lighter variant of our products, as a result the action radius will not decrease that quickly – focus group 1"

However, the participants also described that there is a big challenge in producing lighter products and keep them affordable. At last, multiple participants who described possible dependencies towards the battery within the perspective of knowledge and diversity. To clarify, the participants described that at the moment they have not enough knowledge about the batteries. Also, they described that there will be problems regarding the multiple wirings and types of batteries which are most likely going to be used in the future. These types of information derived out of the following quotes and citations.

"We will have to partner to gather the necessary information about the batteries which is needed to install the products on the vehicles. Next to the difficulty in receiving the information, there is also going to be a problem due to the likelihood of the batteries being different for every vehicle – focus group 2"

The participants described that it will be hard to receive these types of information of the battery producers. Additionally, they highlighted that they need the information from multiple enterprises if there are going to be multiple types of batteries, as an example they mentioned:

"For instance look at all the mobile phones, every type of mobile phone has a unique battery, cable, etc. – interviewee 5"

With this example, the participants try to describe the difficulty in gathering all the knowledge about the batteries within the electric cars. As a result, there could be a big path dependency on the enterprises which develop these batteries in sharing their knowledge about their products.

To summarize, within scenario 1 multiple possible dependencies can occur when this event will take place in the future. The participants described possible dependencies towards the following aspects: action radius, wind resistance, weight (loading capacity and action radius), engineering, information, partnerships, and types of batteries.

4.2.2. Situation 2 – the implementing of autonomous driving of vehicles

The second situation describes the implementation of autonomous driving. Wherein, vehicles are fully driven autonomously. Nowadays, there are car manufacturers who already produce vehicles which can drive autonomous. However, these vehicles do not drive fully autonomous yet and need to win the trust of the customer that it is safe to drive autonomous. In contrary, it is plausible that eventually, vehicles could drive autonomous as a result of the many developments regarding this type of driving.

After a comprehensive explanation of the scenario, a lot of participants recognized a futuristic problem which is already affecting them. This problem which is already a path dependency for the vehicle body building industry contains the placement of sensors on the vehicles. The best explanation derived out of an interviewee who explained:

"At the moment, we are already facing problems towards these types of developments. One example would be the new Volkswagen Crafter which has sensors for driving backward automatically. As we install our products we have to turn off these sensors, however eventually when these sensors become more important this is not an option anymore. – interviewee 2"

The citation above proves the relevancy of the situation for the industry. However, just as in the introduction of the scenario, it is the question of how fast these developments win the trust of the customer after they are introduced. Next to this, the opinion of interviewee 2 indicates that at the moment the options with sensors are limited, as a result of this limitation some customers choose to turn off these sensors. However, the interviewee also indicated that when these sensors become more important in the future, for options such as autonomous driving, the customer is not going to turn off these sensors anymore. In short, the more objectives are involved in the sensors, the more they become inevitable.

Next to the usage of sensors, another interviewee indicated that the placement of these sensors will be crucial for enterprises within the vehicle body building industry. As a clarification, the placement is crucial because the products most of the time are placed outside the vehicle. As a result, it could be that these products are blocking the range of the sensors. This hypothesis is supported by the following statement of interviewee 2:

"The main goal of autonomous driving will disappear when sensors who provide this type of driving are blocked by our products. Therefore, it could be devastating for us when the sensors are installed in the place where our products should be installed. – interviewee 1"

Furthermore, a third aspect of the sensors was detected by a focus group. This focus group indicated that most of the time a few of these sensors will be placed in the mirrors of the vehicles. Besides, just as in scenario 1, they mentioned that some types of vehicle producers use different mirrors and several types of sensors. At last, they highlighted that enterprises within the vehicle body building industry make use of extended mirrors which they produce themselves. As a result, enterprises within the industry have to school their employees regarding the sensors and how to adjust them, if this is possible.

"Some of the sensors are installed on the mirrors of the car, this could result in problems regarding our extended mirrors for some of our products. Besides, this problem is somehow similar to the first scenario, whereby it could be that every mirror has its unique cables and design/type of sensors. For instance, we know that Mercedes uses 36 different types of mirrors for their company vehicles. – focus group 2"

The statements above indicate possible path dependencies towards multiple objectives. At first, the main objective of the sensors is crucial regarding the option to turn off the sensors. Subsequently, the placement of the sensors could result in problems in the field of the installation of the products externally on the vehicles. Whereby, the products must be installed in places where the sensors are placed. Consequently, the products of enterprises within the vehicle body building industry are blocking the range of the sensors. At last, enterprises within this industry could experience path dependencies towards the vehicle producers. These dependencies could be in the form of willingness to share information with enterprises in the vehicle body building industry, the multiple designs and types regarding the mirrors of the vehicles, or the options to change the software of the sensors. To highlight, the last path dependency mentioned, the options to change the software of the sensors, is mentioned by a few participants. The participant defined this option as followed:

"I do not know if this software is adjustable regarding the trailers, I know there are vehicle who can drive autonomous with trailer – focus group 2"

As a result, one focus group focused on the options regarding the ability to adjust the software of the sensors to fit the vehicle made by enterprises in the industry. However, other participants indicated the same dependency but they questioned another side of this dependency. They mentioned that it could be risky to adjust software setting provided by a vehicle producer. The following statement explains what was meant by these participants:

"Next to this, it is questionable if we could be liable if an accident happens due to the modifications to the sensors made by us. – interviewee 3"

This participant indicated that it could be risky when enterprises within the vehicle body building industry are going to adjust sensors which are not made by them. And so, as a result of the two citations above, it could be concluded that there are two major dependencies towards these sensors. Firstly, the adaptability of the sensors towards the modified vehicles. Secondly, the liability of enterprises in the industry after modifying these sensors.

In short, there is one crucial path dependency on the scenario of autonomous driving for enterprises in the vehicle body building industry. This is the path dependency towards the sensors which are used to drive autonomous. However, this is not one path dependency. The following paragraph notes all the possible path dependencies mentioned by the participants which can be linked to the main dependency on sensors.

At first, the path dependency regarding the placement of the sensors, it could be that the product of enterprises in the industry is blocking the range of the sensors. Secondly, the ability to modify the sensors. This modification is necessary to make the sensors fit the external dimensions of the vehicles. Thirdly, the number of different types of mirrors which are produced by the vehicle producers. As an explanation, enterprises in the vehicle body building industry make use of extended mirrors which have to be modified when sensors are placed in these mirrors. At last, there is a path dependency towards the liability of enterprise if they can modify the sensors to make them fit the external dimensions of the vehicle. For instance, the liability of an enterprise if a customer ends up in an accident as a result of a modification made by them.

4.2.3. Situation 3 – law and regulation decide that glass which is transported must be covered

Scenario three describes a law towards the regulations among glaziers in the glazier industry. This trend contains the covering of glass and other building elements when a glazier needs to transport them. For clarification, the regulation contains the covering of glass and building elements for two purposes. Firstly, the main origin of the new law derives out of traffic safety, whereby it is simply safer to cover glass instead of placing it without any cover. For instance, think about the extra damage the glass could create when a traffic accident occurs. Secondly, the new situation could also derive from the glazier their perspective. Wherein, the glazier wants to cover the glass cargo to prevent it from any damage. As a result, there could be two reasons why this scenario could occur, one is from a regulation perspective and the other from the product users' perspective.

As a starter, many participants recognized this scenario already, whereby they mentioned that they were currently testing something similar. They described that at the moment they were testing some type of trailer which contains full coverage of all the elements which are transported on it. Additionally, they acknowledged that this type of trailers was demanded by the customer themselves.

"At the moment, we are testing a trailer with a slidable tarp in front of the products. This development occurred out of a customer who experienced that its glass was damaged during transport by gravel streets. – focus group 1"

The statement above confirms the relevancy of the situation for enterprises within the vehicle body building industry regarding transport solutions for glass. However, the participants within the interviews and focus groups identified multiple dependencies towards this situation. Whereby, again, similar dependencies which were noted in one of the previous situations can be highlighted. For instance, one interviewee highlighted that the weight of the material used to cover the glass will affect the loading capacity of the vehicles.

"The problem is that tarp is also heavy, this will decrease the loading capacity on the vehicle. In addition to scenario 1, this will also decrease the action radius. – interviewee 1"

As can be notified from the statement above, the interviewee indicated that, again, the loading capacity of the vehicle is affected if the tarp is used as a solution. However, the interviewee also indicated that if tarp will be the solution for the cover it will also affect the action radius dependency described in situation 1. Besides from the path dependencies towards the vehicles itself, some participant identified possible dependencies towards the abilities of the company and its employees. These abilities are labeled in the following citation(s):

"The tarp used for the test trailer is made by a third-party. At the moment, I think we do not have the knowledge nor the machines to make this type of products ourselves. – focus group 2"

In the citation above, the participants acknowledged that they do not have the knowledge nor the machines to produce these "tarp" covers. As a result, they said that the cover as it is on the test trailer is produced by a third-party. Therefore, it could be that in the future enterprises in the industry are dependable on these type of third-parties. However, an interviewee described another important path dependency which could be important in the future.

These products would be hard to produce for us, as a result of all our products being custom-made. – interviewee 3

Firstly, a notification towards this possible dependency must be made. This dependency could only affect enterprises which produce custom-made solutions in the vehicle body building industry. To clarify, the interviewee described that enterprises in the industry most of the time produce custom-made transport solution. Therefore, it would be hard for enterprises in this division of the vehicle body building industry to learn their employee's new techniques regarding material adjustments. Additionally, the interviewee mentioned that it is possible to produce these types of products. However, this can only be easily implemented for enterprises which mainly produce mass-production otherwise, it will take years to school the personnel. Additionally to the statement above, a focus group described that it would be handy to produce these types of products themselves if mass production is introduced.

"Maybe, in the future when we have some of our products in mass production it could be handy to produce this tarp ourselves. – Focus group 1"

In contrary to the opinions which mentioned the impossibility to produce these types of products, there was one interviewee who mentioned that this would be possible. However, this interviewee describes one possible path dependency on the engineering department of the enterprise. As a result, this possible dependency only affects enterprises which contain an engineering department in the vehicle body building industry.

"Producing the tarp ourselves will be interesting as the requests to this type of product will increase, our engineering department should find some type of solution. – interviewee 3"

This statement made by the interviewee reflects the same futuristic dependency as described in scenario 2. Whereby, the engineering department within these types of enterprises should find a fitting solution to the problem. However, this possible path dependency should be mentioned as a result of the probability of not finding a fitting solution.

However, next to the possible path dependency towards the engineering department, there could also be a dependency on other employees. This is a result of the statement of one of the focus groups. This focus group described the following:

"I do not think we have the knowledge at the moment to do these types of activities ourselves, also we do not have the machines. – Focus group 2"

This statement can be linked to another possible path dependency which enterprises in the vehicle body building industry could experience if they produce the "new" product themselves. In short, if enterprises within the industry deciding to produce these types of products themselves, they could experience possible path dependencies towards, knowledge, machines, custom-made solution, and their engineering department. Besides, enterprises could also experience possible path dependencies towards the producing third-party and the loading capacity of the vehicle. This loading capacity derives out of the extra weight caused by the cover.

4.2.4. Situation 4 – new legislation towards certified vehicle equipment

Lastly, scenario 4 describes new legislation towards certified vehicle equipment. Nowadays, there are two types of vehicle equipment, certified and uncertified. At the moment, there are no restrictions taken towards the uncertified vehicle equipment however, this could change in the future. This change can be seen as a restriction towards the uncertified vehicle equipment, whereby this type of equipment must be certified. Therefore, the producers of vehicle equipment should follow the standards of certain organizations which are guided by governmental institutions.

After this situation was explained most of the participants agreed that there is a significant chance that this event could occur in the future. Most of the participant mentioned that this new legislation most likely is going to derive out of a traffic accident with uncertified vehicle equipment. For instance, one interviewee stated that there are already certain restrictions towards vehicle equipment which are geographically bounded.

"These law and regulations are already implemented, whereby a particular amount of lashing point is restricted by law. These law and regulations are geographically bounded. For instance, Germany is much stricter regarding these rules than the Netherlands. – Interviewee 4"

This statement not only confirms the relevancy of the situation, but it also describes the first possible path dependency. Whereby, the statement of the interviewee describes that the legislation could be geographically bounded. This means that international enterprises within the vehicle body building industry should be aware of these regulations for every country. Additionally, they identified multiple possible path dependencies regarding aspects in the form of financial capabilities, custom-made solutions, standardization, how-to test, material use, and dependability on currently certified suppliers. These possible path dependencies will be explained in the following paragraphs.

Firstly, an interviewee discussed that enterprises should change organizationally in the form of type of product. Whereby, it was highlighted that enterprises within the industry should change from custom-made products to mass-produced vehicle equipment. This switch is necessary as a result of the probability regarding difficulties deriving from certifying custom-made products. The following citation indicated the first identification of a possible dependency regarding the custom-made aspect.

"If this situation occurs we have to erase our customer-made vehicle equipment line and produce certified mass products. – interviewee 5"

Additionally, the citation indicates that enterprises should diminish their custom-made line as a result of this certify legislation. However, other interviewees and focus groups indicated that this diminishment is dependable on how the equipment is certified and how expensive this is.

"There is a possibility that we can still produce custom-made vehicle equipment. However, we are dependable on how this equipment is tested and the price of the testing. – interviewee 3"

In contrary, there could be other possible dependencies for enterprises within the industry if they decide to diminish their customer-made type of products. For instance, the enterprises will be more dependable on their suppliers, if they make use of these type of suppliers, which provide certified vehicle equipment. These dependencies will be in the form of delivery times, software, price, opportunities regarding other vehicle equipment, etc. These possible path dependencies derive out of the following citations:

"Additionally, we do not want to be too much dependent on other third-parties. To clarify, the production time will be longer, which makes the delivery time also longer. – interviewee 2"

"We lose too much of our flexibility if we are fully dependable on our current suppliers, furthermore this is not in line with our vision of producing a custom-made solution. – interviewee 3"

"We are a partner of supplier X, to keep this license we have to follow certain courses, guidelines, and use particular software. – interviewee 5"

As described before, the citations above can be linked to possible path dependencies enterprises within the vehicle body building industry could experience when diminishing their custom-made products line. However, it is also interesting to know which possible path dependencies could derive when enterprises do not want to diminish their custom-made production line. Therefore, the participants were also asked which difficulties they think will occur when enterprises within the industry try to certify custom-made solutions. This question provided data which could be used for enterprises within the industry for futuristic anticipation. To start, a focus group described that in countries wherein these types of certifications are already regulated, material usage is a major aspect. This aspect is mentioned in these results as a consequence of the following citation:

"We could keep producing custom-made solutions. However, we will be dependent on the material. As a clarification, we should certify our installation- and main material. – focus group 1"

The statement above describes that the custom-made solutions can be certified within a situation wherein only installation and main material must be certified. This certification process derives out of the experience of certain employees which indicated that in geographic area X this is the process for certifying vehicle equipment. However, this manner of certifying does not count for enterprises in the industry which do not operate in this geographic area.

The last mentionable possible path dependency contains the manner how these certification processes work. As already described in the previous paragraph, there are countries which already follow a certain process. However, it may not be assumed that every country follows the same certification process. This statement is mentioned by several participants within the interviews and focus groups, which stated:

"Within this situation enterprises will be very dependent on how the products will be certified regarding the type of test they have to complete. – interviewee 1"

This statement by the interviewee indicates that there could be multiple manners in testing this vehicle equipment. However, another participant also identified that these tests could be with the help of a crash test, which is known to be very costly. Therefore, this participant mentioned:

"I think there could be financial problems for enterprises within the industry if these certifications processes will be in the form of crash tests. – interviewee 3"

In the end, the certification of vehicle equipment scenario provided a lot of possible dependencies for enterprises within the vehicle body building industry. Highlightable, is that these dependencies are not the same for every enterprise in the industry. For instance, aspects as geographic operation area and types of products (custom-made or mass-produced) must be taken into account. Lastly, it is mentionable that all the enterprises will be dependent on the manner how the products will be tested when this scenario occurs.

5. Conclusions & Recommendations

The last chapter of this study describes the conclusions and recommendations of the research. Wherein, the goal of the study is to provide an overview of the limiting effects of path dependence regarding organizational change that could occur as a result of futuristic environmental influences for enterprises in the vehicle body building industry. In section 5.1, the conclusions about this study will be noted. Thereafter in section 5.2, the recommendations of this study are defined. After an overview of the conclusions and recommendations, section 5.3 and 5.4 will provide descriptions of the implications and limitations of the study. At last, the possibilities regarding futuristic research are described in section 5.5.

5.1. Conclusions

The following paragraphs provide a comprehensive overview of the key findings done in the study related to answering the research question: *"How is organizational change in the vehicle body building industries limited by path dependencies derived out of environmental influences?"* Therefore, following paragraphs are divided into three different sections to describe the key findings done in this study.

5.1.1. Literature study

Firstly, the key findings done in the literature study of this study are discussed. These results indicated that enterprises can be limited by path dependence as a result of the choices made in the past by these enterprises. These choices can limit enterprises regarding the possibilities left for the enterprises towards "new" environmental influences which need organizational change to anticipate. Whereby, the concept of path dependence will be hardest to overcome regarding environmental influences with a low frequency, high amplitude, high speed, and high scope (Suarez and Oliva, 2005). However, the aspect speed is questionable towards the futuristic scenarios of autonomous driving and replacing fuel-powered engines. In contrary, the other two scenarios will not have a low speed, as a result of these scenarios being bounded to law and regulation.

5.1.2. Semi-structured interviews and focus groups.

The result of the semi-structured interviews and focus groups display multiple possible path dependencies pro scenario. These multiple possible path dependencies are based on quotes and citations done by the participants in this study. However, this study cannot conclude anything about the importance of any possible dependency above another. Additionally, it cannot say anything about the relevancy of one possible dependency above another for the enterprises in the industry. Therefore, this section gives a short summarization of the possible path dependencies for the two industry separately in the future.

The automotive industry

As a reminder, the two situations regarding the automotive industry contain the switch of fuel-powered engines to electric ones and the implementation of autonomous driving. Both scenarios can be seen as an "avalanche" environmental influence (Suarez and Oliva, 2005) however, the aspect of speed is discussable. This aspect is discussable as a result of several relevant sources indicating that it will take some period to implement both scenarios to the real world. This is a result of the trust which has to be won at individuals to drive autonomously and the time it takes to replace fuel-powered engines.

To start, enterprises in the vehicle body building industry could experience path dependencies towards the loading capacities of vehicles. This will be a result of the extra weight of the battery concerning the fuel-powered engine. Therefore, there could be a material switch, as a result of the necessity to lighten the products. Whereby enterprises in the industry could be dependent on their engineering department. These departments have to find fitting solutions regarding these new materials in the products.

Additional to the loading capacity, the action radius of the electric vehicle could also be affected by the weight of the battery. Whereby, the action radios can decrease as the weight of vehicle increases. As a result, this event could also increase the urge to lighten the materials of the products. At last, enterprises can experience dependencies towards their knowledge regarding batteries. Wherein, the enterprises who produce the batteries owns the knowledge which is necessary to make adjustments to the batteries. As a result, enterprises in the vehicle body building industry could be dependent on the willingness of these enterprises to share these types of information. Next to this, it could be that every electric vehicle has its unique battery with its cables and other components. This results in additional information to gather and learn from these enterprises. To highlight, this type of dependencies could also occur for the sensors regarding autonomous driving.

In extent to the uniqueness of the sensors, it is mentionable that the products of enterprises in the industry could block the range of the sensors. This will make the sensors unusable. Furthermore, enterprises are dependable on the modification possibilities of these sensors. Whereby, there is an urge to modify these sensors in relation to external products installed which are not taken into account by the sensors. As a result of these modifications, again, the enterprises are dependable on the willingness to share information about the sensors. At last, there could be a dependency regarding liability when enterprises are modifying these sensors. Wherein, enterprises could be liable regarding emerging traffic accidents as a result of these modifications.

The glazier industry

The situations for the glazier industry can be seen as “avalanche” environmental influences. These scenarios do have a high power towards the aspect speed as a result of both scenarios being linked to law and regulation. Therefore, if the situations are being real-world events they will be implemented immediately or from a specific date.

As a starter, the industry could also experience a path dependency towards loading capacity as a result of the additional weight deriving from the coverage. Next to this, it is mentionable that if scenario 1 occurs the action radius could also be affected by this extra weight. Also, enterprises with no experience in producing these coverages can be dependent on third-parties which have to produce these coverages for them. As a result, a dependency on the knowledge and machines to produce these coverages could occur. Furthermore, it is harder for enterprises with custom-made products to implement these coverages. This is a result of every project being different. Therefore, it can be said that enterprise with activities regarding custom-made products will experience more dependencies than enterprises with activities in mass-produced products. Additionally, this will also count regarding the certification of vehicle equipment. Wherein, enterprises with custom-made vehicle equipment can experience more possible dependencies than enterprises which product mass-produced vehicle equipment.

Furthermore, enterprises in the vehicle body building industry can be dependent on how these certifications of vehicle equipment are done. This will most likely be from a financial perspective. For instance, does the entire vehicle have to be certified or only the material of the equipment if an enterprise produces custom-made vehicle equipment. Next to this, there could be limiting effects for the enterprises regarding material options if only the material of the equipment has to be certified. At last, enterprises could be too dependent on third parties when they choose to diminish their custom-made solution line and are going to act as a supplier of mass-produced products. These dependencies will be in the form of delivery time, price, flexibility, vision, and guidelines.

5.2. Recommendations

This section will provide a short recommendation for the enterprise under investigation their possible futuristic path dependencies for the automotive- and glazier industry. Wherein, the possible dependencies and their possibilities for the enterprise are noted. These possibilities derived out of the semi-structured interviews and focus groups. Whereby, the investigator asked the participants what the futuristic possibilities will be for the enterprise when a futuristic path dependency occurred. The following paragraphs will describe the most important solutions found to the futuristic path dependencies pro scenario.

Scenario 1

As already mentioned before, scenario 1 entails the change of fuel-powered too electric-power engines. Within this scenario, there were multiple path dependencies highlighted. Next to this, the participants mentioned multiple possibilities for the enterprise which they could consider to implement before or when this scenario happens.

Firstly, there were multiple dependencies for the enterprise regarding the battery of the vehicle within scenario 1. However, participants described possibilities towards this path dependency in the form of partnerships.

"I could see us partner with one of these battery producers with the main goal to develop a battery for the vehicle body building industry. – interviewee 3"

In addition to the possibility described above, another participant supported this statement somehow by mentioning the following:

"Maybe there is a possibility to place a battery on our trailer to increase the action radius of the vehicle. This can be done in the form of a partnership"- Interviewee 1

As a result of the question "what kind of possibilities do you see left for the enterprise when this happens?" both participants indicated a partnership with a battery producer. However, it is mentionable that there is a chance that new dependencies could be created towards this battery producer. In contrary, if the partnership creates additional value for the enterprise, the battery producer could mean significant value for the enterprise.

Lastly, some participants mentioned that they could try to develop solutions for smaller vehicles or vehicles in the form of bicycles. The last one mentioned could be a fitting solution in big cities. Additionally, it supports environmentally friendly regulations which are nowadays getting more important.

Situation 2

As a reminder, situation 2 contained the implementation of autonomous driving. Whereby, almost all the futuristic dependencies described were about the sensors necessary for this manner of driving. However, some participants indicated options which could be relevant. One of these options was partnering with one of the sensor producers to produce products with integrated sensors. As a result, the option to drive autonomously will still be available however, another dependency could counteract this. To clarify, this is the dependency on the usage of different sensors on different types of vehicles. As a consequence, the enterprise could end up partnering with multiple sensor producers. Next to this, it remains a question mark if these types of enterprises are willing to partner.

Situation 3

Situation 3 described the necessity of coverage when transporting glass. This necessity derived out of law and regulation principles. Within this scenario, multiple dependencies were highlighted, mentionable is that some of these dependencies were supplemental to the dependencies found in scenario 1. Whereby, the extra weight of the coverage would increase the dependency on the action radius even more. Next to this, the participants identified possibilities in this scenario in the form of partnerships. The main goal of these partnerships is to produce custom-made solutions for customers which demand coverage. However, again, there could be new dependencies towards this third-party in the same forms as mentioned before (e.g. delivery times, price, guidelines, etc.) Lastly, mentionable is the possibility to refocus the business activities to another type of product within the assortment. Multiple participants indicated that the enterprise could refocus to their pick-up type of products. They highlighted that these pick-ups could be covered and used as transport space at the same time. Next to this, the participants mentioned that the enterprise had already some experience within these activities.

Situation 4

The last situation used in this study entails the prohibition of uncertified vehicle equipment to reduce the number of traffic accidents. As a reminder, there are two major dependencies within this situation. This were the dependencies on the manner of how the products will be certified and the dependency on the enterprise producing custom-made solutions. However, the following possibilities can be seen as strategical options, but also the possibilities are dependent on the manner of certifying the products. In short, two strategical options were identified by the participants. At first, the participants indicated that the enterprise could certify their main material and mounting material. However, this strategical option only works if this possibility fits the futuristic guidelines regarding law and regulation within this scenario. The other strategical option is in the form of organizational change regarding the shift of custom-made solutions too mass-produced solutions. Nevertheless, this option also only works if it is possible to certify the main material and mounting material. Additionally, it must be taken into account that this shift is most likely costly regarding the acquisition of new machines.

The paragraphs above try to describe the best fitting solutions identified by the participants for the enterprise pro scenario. However, it could be that these possibilities are not relevant in the future due to a change of circumstances towards a particular situation. For instance, it could be that the future does not entail electric-powered engines but hydrogen-powered ones. As a result, the possibilities towards the partnerships for developing a battery are not relevant anymore.

5.3. Discussion: theoretical implications

As a comparison with other similar studies, this study differentiates itself due to the usage of possible futuristic scenarios. Whereby, the other similar studies made use of historical changes or influences an industry or enterprise has experienced. Therefore, this study could give futuristic researchers insights into how to investigate or identify path dependencies in a single-case study with the help of futuristic scenarios. Additionally, the study provides insights for enterprises within the vehicle body building industry. Whereby, the study makes a difference between the different types of enterprises within the industry. For instance, the differentiation made regarding the possible path dependencies for enterprises which produce both, mass-produced products and custom-made products.

Furthermore, the study tests the hypothesis made by Garud et al., (2009) and Vergne & Durand (2010). Wherein, these studies describe that participants within semi-structured interviews and focus groups can be used to identify possible path dependencies. However, the participants must experience a simulation, whereby the details of the futuristic situation are clear. These statements described in the studies are only described theoretically. Therefore, this study is the first study which tries to identify possible futuristic path dependencies with the help of actors (participants) and situations (simulation) for enterprises in the vehicle body building industry.

Additionally, the study emphasizes multiple times that the concept of path dependencies is not used concerning futuristic scenarios in the past. However, Garud et al., (2009) and Vergne & Durand (2010) indicated that this can be done when the participants are supported with simulations on the futuristic scenarios. As a result, the participants have deeper insights and there is a chance that they devise “new” relevant futuristic dependencies in comparison with no simulation. Nevertheless, I learned that the combination of path dependencies and futuristic scenarios will only work if the investigator uses concrete and abstract futuristic scenarios. Otherwise, there can be a difference in the experience of understanding the futuristic scenario between the participants. As a consequence, one participant could think of irrelevant subjects that are not related to the futuristic scenario. For instance, the situation of implementing autonomous driving can be experienced differently by the participants. Therefore, one could think that autonomous driving is the function of a vehicle to park by themselves. Consequently, the participant forgets about many aspects of the futuristic situation. In short, the investigator must ensure that every participant has the same mindset in understanding the futuristic scenario.

Besides the theoretical implications, I want to use this section to describe the aspects I learned when combining the concept of path dependencies with futuristic scenarios. Additionally, I want to elaborate if the combination of the two concepts worked as expected. Firstly, one of the memorable aspects I learned is that it is hard to create an understandable simulation for participants about futuristic scenarios which are not a hundred percent mapped out. As a consequence of the futuristic scenarios being not 100 percent mapped out yet, there could be changes or developments regarding these scenarios in the future. For instance, it could be that not electric driven engines, but hydro driven engines are going to be the future.

Secondly, there is a ton of literature written about the concept of path dependencies. All this literature is based on historical changes regarding particular industries. Next to this, there are not that many studies that provide information on how to identify futuristic path dependencies. To highlight, there is no other study were can be referred to which investigates path dependencies with the help of futuristic scenarios, especially not in the vehicle body building industry. As a result, this study used some material already written about path dependencies however, the results based on the futuristic scenarios cannot be compared to any other study within the concept of path dependencies.

At last, I want to briefly elaborate if the study worked and the precision of its outcomes. To start, the concept of path dependencies combined with futuristic scenarios does work. However, the precision of its outcomes is not that precise as expected in the beginning. This lack of precision can be subjected to the study being a futuristic one. The futuristic aspect of the study develops problems regarding the predictability of the scenarios. To clarify, it is not 100 percent mapped out how the

scenarios are going to be implemented in the real world. Therefore, the concept of path dependencies cannot be subjected to two different aspects found by Koch (2008) and Liebowitz and Margolis (1995). These investigators describe that path dependencies can be linked to three different levels of dependencies (Koch, 2008) and three different degrees of dependencies (Margolis and Liebowitz). Whereby, these levels and degrees are used to indicate the options left for enterprises in the industry and the inefficiency and costs of the dependencies. However, due to the unpredictability part of the futuristic scenarios, these degrees and levels are not taken into account within this study. In my opinion, these degrees and levels can only be taken into account regarding studies based on historical studies regarding a certain industry. As a result, the study describes the futuristic dependencies of enterprises in the vehicle body building industry regarding four different scenarios. However, the options left for enterprises in the industry and the inefficiency/costs regarding these scenarios cannot be not noted as a result of the unpredictability. Furthermore, the options left and inefficiency/costs differ for every enterprise in the industry. As a consequence, this study its results only describe the identified possible dependencies for enterprises in the vehicle body building industry.

5.4. Limitations

The study contains certain limitations concerning:

- The subjectivity of the participants within the study. For instance, it could be that a possible path dependency identified by a participant is not limiting regarding the opinion of another participant. In contrary, there is a chance that the individual identifying the limiting aspect has knowledge which the other participants did not have. As a result, it is not possible to diminish these identified dependencies.
- The futuristic scenarios are based on multiple high-quality sources which indicate that there is a high probability that the events will happen in the future. However, it could be that these scenarios will not happen, this could be as a result of developments in the meantime. Therefore, it is difficult for the enterprise to decide on which possible path dependencies they should anticipate on and which dependencies they should ignore.
- Only two focus groups out of the five which were planned are held. This is a result of the participants in other focus groups not having enough knowledge of the industry. Therefore, the data used in the study is gathered from 12 different participants.
- The data used in this study is based on the opinions of participants regarding futuristic scenarios. Therefore, it could be that not every participant has enough knowledge of certain subjects to propose itself the simulated situation. As a result, the simulations are to the investigator its knowledge simulated the best way possible. However, it could be that the participants experienced this the other way around, in spite of the investigator asking the participants if the situation is clear enough.

5.5. Future research

Besides the results deriving from the gathered data within this research, there are some recommendations which can be used for research in the future, for as well enterprises in the industry as the concept of path dependencies. For instance, this study focuses on the path dependencies deriving out of two industries where enterprises within the vehicle body building industry can be affected by. However, there could be other possible path dependencies regarding the enterprises internally. For instance, the enterprises could investigate the possible path dependencies towards their headquarter regarding being a subsidiary (if they are one). Additionally, there could also be path dependencies towards the different cultures working in the enterprises (if different cultures are present).

Next to this, there could also be any futuristic research regarding the method used within this study. Whereby, the methodological process is used within a larger enterprise. As a result, it could be that this study finds more possible dependencies, as a consequence of having more participants within the data collection. Furthermore, there could also be futuristic investigation possibilities regarding the methodological process regarding path dependencies on an industry level. Wherein, the researcher does not focus the data collection on a single case, but on multiple organizations within one industry. Consequently, the data of the participant will not be bounded to a single enterprise but contains participants out of multiple organizations their opinions.

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Appendices

Appendix 1 – Visualization of the theoretical framework within the study

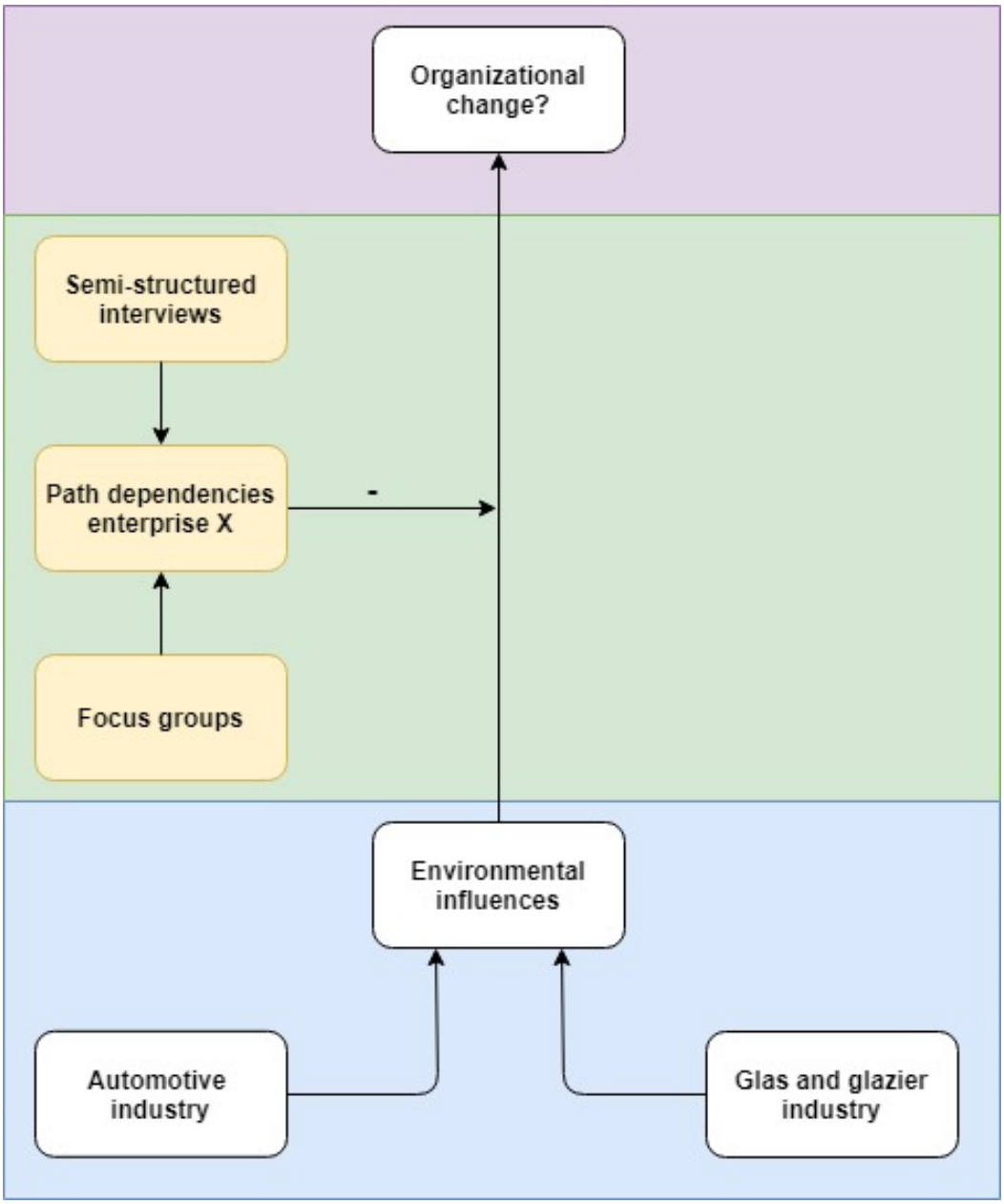

Figure 1: visualization of the theoretical framework used in this study

Appendix 2 – Visualization path dependency theory

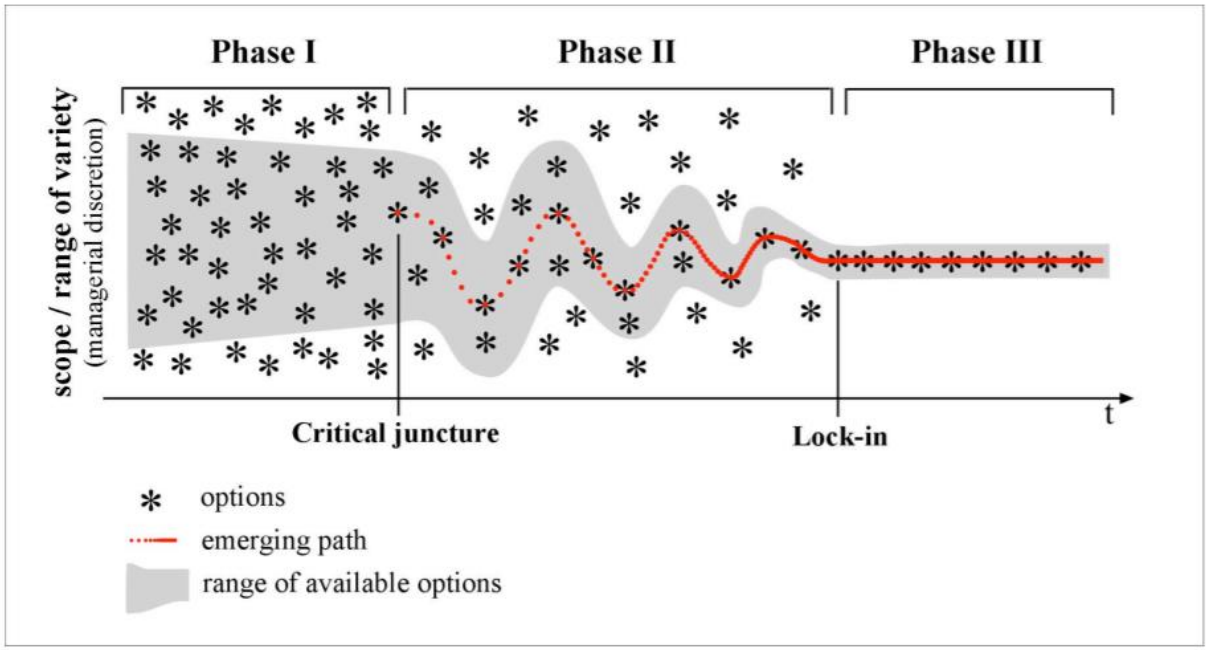

Figure 2: visualization of the path dependency process defined by Koch (2008)

Appendix 3 – Example of Wenzel (2015) identification of path dependence.

The end of the Golden Age of funeral homes began in the 1990s, when the competitive landscape started to change. During this time, so-called "discount funeral homes" entered the market. From the beginning, these new market players attempted to attract consumers with heavy price advertising.

> One of the leading [funeral] discounters advertised in the press with an opened coffin and with the slogan, 'The Aldi [low-priced discount retail chain] of funeral homes.' (Expert 2)

Particularly because of the stabilizing nature of the non-aggression pact among incumbents that had facilitated the success of the strategic pattern, such market activities had been unknown in the industry. Although only a few discount players initially entered the funeral market and gained market share slowly, competition intensified when more and more discount funeral homes were opened. The service concept of the discount funeral homes eventually took off by the end of the 1990s in parallel with the emergence of the Internet.

> During that time, something emerged that had not existed before: there were [discount] funeral homes that offered funerals on the Internet and sold them supra-regionally. (Expert 12)

With the introduction of Internet offers, discount funeral homes gained a dominant market position and "simply destroyed the funeral industry" (Expert 4). Because of the low visibility of Internet purchases, not even societal norms could prevent consumers from switching to discounters. Because the new market players sold their services supra-regionally, the non-aggression pact among the incumbent funeral homes could no longer guarantee repurchases by regular customers. Thus, the code lost its self-reinforcing attractiveness and "did not play a big role anymore" (Expert 11). Accordingly, competition in this industry turned into "cut

Figure 1: example of quotations and citations indicating path dependence