Selected Studies in Behavioral Decision-Making: The Influence of Failure, Innovation and Time Perception in Entrepreneurship and Management

Dissertation

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List of Abbreviations

B……. Unstandardized beta coefficient

B2B……. Business-to-business

CEO…… Chief executive officer

e.g. ……. Exempli gratia / for example

Et al. ……... Et alii / and others

i.e. …….. Id est / that is

M …… Mean

MBA …….. Master of business administration

ME ……. Marginal effects

n ……. Sample size

OLS …… Ordinary least squares

p ……. Probability level

p. …… Page

PhD …… Philosophiae doctor / Doctor of Philosophy

R&D …….. Research and development

R^2 ……... R-squared

SD …….. Standard deviation

SE …… Standard error

SME ……... Small and medium-sized enterprise

TMT ……... Top management team

US …….. United States

USD ……... US Dollar

$\chi 2$ ……... Chi-squared

% …… Percent

A Research Framework

1 Introduction

“Organizations survive or disappear primarily thanks to the quality of management that leads them. Decision-making is not the only, but the basic function of management that contributes most to the success or failure of the organization” (Puseljic et al. 2015, p. 234). Entrepreneurial and managerial projects involve many decision-making processes and decision points that are highly relevant in the context of behavioral decision-making. These decision processes and decision points – such as growth, investment, or personnel decisions – are important milestones in entrepreneurship and management and point the way for further entrepreneurial action, resource allocation and the potential success of a business unit or entire company (Shepherd et al. 2015). In addition, it is a major challenge for all established companies to remain innovative, identify new business opportunities and act entrepreneurially throughout the entire lifecycle of a company (Phan et al. 2009; Hornsby et al. 2009; Kammerlander et al. 2015).

Decision-making becomes already important in the early beginning of a company’s life cycle. Starting with the opportunity assessment decisions, entrepreneurial decisions set the course for further development and management of companies (Shepherd et al. 2015; Mitchell and Shepherd 2010). Following the purely entrepreneurial idea, entrepreneurial entry decisions have to be addressed to become an entrepreneur and manager of a young company (Levesque and Minniti 2006; Shepherd et al. 2015). Thus, the next step is to implement this idea and develop a strategy that can be realized. After the conception of how to implement the idea regarding the product or the service, the question arises for an enterprise about the procurement of necessary resources (Baker and Nelson 2005). If resources can be obtained, decisions are to be made

regarding the piloting of the business intentions (Kolvereid and Isaksen 2006). Particularly in the context of entrepreneurship research, it is frequently examined which factors favor successful market entry in the early phases of a start-up and which success factors are necessary in these early phases in order to successfully establish oneself or rather one's venture in the desired market (Bailey 1986; Sarasvathy et al. 2013; Hsu et al. 2015). In the context of entrepreneurial entry decisions, prior research has shown that pursuing the path of an entrepreneurial career is influenced by an individual's desires, abilities, perceptions of the environment (e.g. dynamism), opportunity costs and decision-making heuristics (Bird and Schjoedt 2009; Liñán and Fayolle 2015; Summers 2000; Shepherd et al. 2015). This indicates that business decisions can depend on several influencing factors that need to be identified and considered if successful decisions are to be made.

Within the scope of this dissertation, the focus in the area of behavioral decision-making in entrepreneurship and management is on factors that address the success and influencing factors on entrepreneurial decisions but also go beyond the initial phase of starting a venture. Thus, managerial decision-making and influencing factors on management decisions are also addressing in this dissertation.

During an entrepreneurial lifecycle, an entrepreneur or company leader is particularly faced with the question of what kind of innovation and growth he or she wants to achieve in the market. On the one hand, there is the possibility of making progress with the existing products and services and, if necessary, modifying these products and services slightly in order to offer consumers a varied range of products. In accordance with the minor modifications to the product or service, growth and innovation here is limited to an expansion of existing offerings and can also be called an exploitative innovation (March 1991; Benner and Tushman 2003). Besides those exploitative innovations, there is also the possibility of actively opting for a radical change

in existing products and services and, in the sense of a complete revision of the existing business model or creating new markets, going into a complete reconfiguration. In research, a decision in favor of such radical innovation and entrepreneurial change is also referred to as explorative innovation (March 1991; Benner and Tushman 2003). Following these fundamental entrepreneurial and managerial decisions regarding the question of innovation and further market developments, the phase of the implementation of these decisions follows, in which one also recognizes how successful the idea for further innovation actually was. This shows once again the importance of entrepreneurial and managerial decision-making on the respective form of innovation for the course of a company. Accordingly, this dissertation also deals with the question of innovation in the sense of an explorative and exploitative innovation and which cognitive influencing factors as part of the characteristics of an entrepreneur can favor or trigger such a decision (Shepherd et al. 2015).

But what happens if those innovations have not led to the desired success and an entrepreneurial unit has closed or the company has failed as a whole? Another important consideration in the context of this dissertation is the factor of entrepreneurial failure. If the desired growth or a stable position in the market could not be achieved, if a successful exit was not possible, the failure of a young company can be promoted. If entrepreneurs have failed with their venture, there is an important decision-making challenge for them (Hsu et al. 2015; Baù et al. 2016; e.g., Amaral et al. 2011; Jenkins and Wiklund 2012). Here, entrepreneurs are faced with the decision of whether they should found a new company and whether the immediate consequences of the failure experience exceed the chances of a new start-up and thus, further entrepreneurial activity is excluded or barely favorable for the now ex-entrepreneurs (Shepherd et al. 2009). Influenced by the immediate aftermath or costs of failure, sensemaking processes begin of what actually happened and how to cope with the failure (Cope 2011; Singh et al. 2007). That occurs primarily

through cognitive processes which in turn influence his or her decision-making and resulting cognitive outcomes. The entrepreneur allocates whether a new foundation is desirable and feasible and builds up intentions for himself or herself of founding a new company again. This management decision includes a high degree of cognitive influences, reflection and entrepreneurial consideration and represents an important component of an entrepreneurial, as well as managerial decision-making process (Shepherd et al. 2015; Shapero and Sokol 1982). Accordingly, this dissertation aims at showing how the individual's perception of failure also has an influence on the intention to re-enter into entrepreneurship and the decision to start again, and which cognitive factors favor an entrepreneur or manager to take the plunge into business one more time.

2 Research Gaps and Overview of Studies

2.1 Overview of studies

Judgment and decision-making research is a central stream in the field of entrepreneurship and management literature and yet, it is not as established as in the fields of psychology, sociology, and political science (Shepherd et al. 2015). Despite growing research interest in entrepreneurial and managerial decision-making, many research gaps remain. The present dissertation consists of three studies relating to the common theme of entrepreneurial and managerial decision-making within the framework of the topics *Failure, Innovation and Subjective Time Perception*. In the following, a summary is provided of the research gaps, objectives and each contribution of the three independently conducted studies.

An overview of the topics examined in my three studies including the methodological approach chosen to examine my research questions and the contribution of each study is presented in

Table A-1 below. Study 1 is a conceptual study that bridges established theories and constructs into a research framework. It addresses the topics of entrepreneurship, cognitive psychology, failure, coping and the attribution theory. Study 2 then focusses on the topics of entrepreneurial and managerial decision-making, as well as time perception, innovation and the external environment by examining psychological mechanisms via a survey with CEO´s and TMT´s. Study 3 addresses both entrepreneurial and managerial decision-making aspects and tests the robustness of differences in times perceptions in innovation decisions in an experimental setting and enriches the nascent literature of individual time perception in entrepreneurial and management research.

Table A-1: Overview of the three studies constituting the dissertation

No.	Paper 1	Paper 2	Paper 3
Title	When Entrepreneurs get Serial – A Cognitive Model on Entrepreneurial Re-Enter after Failure	CEO's Temporal Focus, Environmental Dynamism and Innovation	The influence of temporal focus on exploratory and exploitative innovation – An experimental approach
Topics in Decision Making	Cognitive Psychology, Failure, Coping, Attribution Theory	Time Perspective, Psychological Antecedents of Exploration & Exploitation, Boundary Effects of External Environment	Time Perspective, Exploration, Exploitation, Boundary Effects of External Environment
Methodology	Conceptual	Survey with CEO's & TMT in the Netherlands (gathered by Ingrid Verheul & Michiel Tempelaar)	Experimental research approach: 2x2 between-subjects design. Two survey experiment on Amazon Mturk
Contribution	▪ Examines the impact of failure on future entrepreneurship ▪ Complements prior empirical studies on serial entrepreneurship and entrepreneurial failure with a theoretical frame ▪ Extends our understanding of the entrepreneurial process from failing with one venture to the emergence of another one	▪ Examines psychological mechanism and impact of time perspective in management decisions ▪ Adds to scarce stream of cognitive antecedents of exploitation and exploration based on managers' characteristics ▪ Advances psychological foundations of executive's decisions in changing environmental conditions	▪ Tests robustness of differences in time perspective in innovation decisions ▪ Enriches the nascent literature of individual time perception in business research ▪ Advances understanding about antecedents of exploratory and exploitative innovation

2.2 Study 1: When entrepreneurs get serial? - A cognitive model on entrepreneurial re-enter after failure

The first study of this dissertation seeks to investigate the following research questions:

- What are the cognitive drivers for a re-enter after failure?
- What role plays the individual perception of the failure?
- What are implications of a re-enter for future entrepreneurship?

When people become entrepreneurs and start their first business, many of them fail (Brüderl et al. 1992; Shane 2009). Some of them leave the domain of entrepreneurship and some decide to start anew, despite of their often traumatic failure experience – i.e. there is substantial variance in entrepreneurs' individual responses to a failure event (Jenkins et al., 2014). The question what drives those failed entrepreneurs to start again and become a serial entrepreneur has received interest in the entrepreneurship literature (e.g., Amaral et al., 2011; Baù et al., 2016; Hsu et al., 2015; Jenkins & Wiklund, 2012). However, underlying mechanisms why so many re-enter and become serial entrepreneurs is still a "black box" as current scholars are stating (Baù et al., 2016; Stam et al., 2008). Understanding the mechanisms and its consequences have important implications for the success of serial entrepreneurship and thus, can impact economic growth (Gompers et al. 2010) and wealth creation (Scott and Rosa 1996).

The first study of the dissertation aims at addressing this research gap by developing a conceptual model and bridging theories on entrepreneurial intentions with the literature streams on entrepreneurial failure and serial entrepreneurship to explain intentions to re-enter after previously failing with one's venture. As prior research identified intentions as the single best predictor of actual future behavior (Schlaegel and Koenig 2014; Zapkau et al. 2015), the study draws on prominent intentions theories to explain entrepreneurial re-entry (Ajzen 1991;

Krueger and Carsrud 1993; Krueger et al. 2000). Furthermore, the study examines antecedents and implications of entrepreneurial failure that lead to increased re-enter intentions and builds up on the aspect of the drastic cut in the life and work of a founder when he or she has failed. The perception of the situation and the magnitude of failure is individually different (Jenkins et al. 2014). The study suggests that the costlier the failure (in terms of economic, psychological and social cost), the lower the perceived feasibility and desirability of an entrepreneurial retry and in turn, the lower the intentions to try again. Moreover, during the process of coping with failure and building intentions to re-enter post business failure, the study implies that the relationship between costs of failure and perceptions of feasibility and desirability to re-enter is contingent on an entrepreneurs' attributional style, i.e. how entrepreneurs make sense of what happened during failure and how they interpret causes of failure (Askim & Feinberg, 2001; Cardon & McGrath, 1999; Shaver et al., 2001).

Research implications point to psychological mechanisms that explain the intention to re-enter after a failure and that the attributional style of an entrepreneur not only influences the formation of re-entry intentions but has critical implications for serial entrepreneurship. By failing with one's business, entrepreneurs can learn from that experience and use their knowledge post failure for new business ideas (Cope 2011; Sarasvathy et al. 2013; Minniti and Bygrave 2001; Ucbasaran et al. 2013; Sitkin 1992). Accordingly, entrepreneurial failure can partly generate learning effects that would not be present in successful businesses (Rerup 2005).

We contribute to the entrepreneurship, psychological and behavioral literature by complementing prior research on serial entrepreneurship and entrepreneurial failure with a theoretical frame. Therewith, our study enhances our understanding of the process from failing with one venture to the emergence of another one and therewith, sheds some light on the "black box" of the mechanisms why so many re-enter and become serial entrepreneurs after failure.

2.3 Study 2: Exploratory and Exploitative Innovation in SMEs: The role of CEO's Temporal Focus

The second study aims at gaining an understanding how perception and cognitive filters influence entrepreneurial decision-making. In study two, the research questions focused on the following aspects:

- How do temporal filters mold expectations and evaluation of executives?
- Does the temporal focus of CEO's influence different forms of innovation in SMEs?
- How does the external environmental influence this relationship?

These questions arose from existing research gaps in the context of entrepreneurial decision-making, subjective time perspective and the different forms of innovation, namely explorative and exploitative innovations. How executives think and perceive time, i.e. their temporal focus has an impact on entrepreneurial and strategic decision-making (Das 2004; Nadkarni and Chen 2014). In the second study of this dissertation it is examined how temporal focus – a relatively stable individual trait that refers to the attention that we pay to thinking about different time periods (Shipp et al. 2009; Chishima et al. 2017) – influences innovation activity in small and medium-sized enterprises (SMEs). Using a matched sample of CEOs and members of the top management team (TMT) in 150 SMEs in the Netherlands, the study finds that CEO's temporal focus contributes significantly to adopting generative thinking and pursuing of exploratory and exploitative innovation. Furthermore, the environmental context plays a role and it is argued that environmental dynamism acts as a boundary condition and needs to be taken into account to fully understand the impact of time perceptions on strategic outcomes. The study finds that the influence of temporal focus on innovation strategies varies under different degrees of environmental dynamism.

This study contributes to the literature in several ways. First, prior research focus on the question of which organizational factors influence explorative or exploitative innovations (Chang et al. 2011; Eriksson 2013; Sidhu et al. 2004). However, studies at the individual or team level that study the cognitive antecedents of exploitation and exploration based on individual's characteristics are scarce (Ahmadi et al. 2017; Laureiro-Martínez et al. 2015; Lavie et al. 2010). This study addresses the research gap with regard to the decisions of managers and executives on the type of innovation, influenced by psychological attributes (Gupta et al. 2006). This is particularly relevant in a SME context, given the common low hierarchy levels and the authority structures there, the influence of CEOs in SMEs is even stronger compared to larger firms (Bierly and Daly 2007; Man et al. 2002; Kammerlander et al. 2015, p. 583). Second, considering the impact of subjective time perceptions is a nascent field of research in entrepreneurial or management decisions and is increasingly considered important. Different views of time create distinct temporal filters that influence how entrepreneurs and company leaders view the world, in turn affecting their strategic decisions and business outcomes. However, there are only a few studies so far examining this relationship so far (Das 1987; Yadav et al. 2007; Nadkarni and Chen 2014). By drawing on temporal focus theory (Shipp et al. 2009; Zimbardo and Boyd 1999), a psychological perspective on executive's strategic decisions is developed in the second study and hence, a contribution to the emerging literature of the role of subjective time perception in strategic decision-making. Third, the study provides a more comprehensive understanding of the boundary conditions through contextualizing this relationship in different states of the external environment. By drawing on the executive's demand literature (Hambrick et al. 2005; Hambrick 2007), the study explains how the influence of a CEO's temporal focus on exploratory and exploitative innovation is contingent upon dynamic environmental conditions.

2.4 Study 3: The Influence of Temporal Focus on Exploratory and Exploitative Innovation

The third study's research objective is to investigate the influence of individual's temporal focus on explorative and exploitative innovation in an experimental research approach.

Accordingly, study 3 was based on the following research questions:

- How do individual temporal differences affect different forms of innovation?
- Are there systematic differences between individuals towards innovation decisions based on their temporal focus?

The aim of the third study is to test whether there are systematic differences in the decision to pursue explorative or exploitative innovation based on differences in individual's temporal focus. While previous studies mainly observe managers in companies (Yadav et al. 2007; Nadkarni and Chen 2014), an experiment will clarify to what extent temporal focus generally predicts differences in innovation decisions. Study 2 nuances prior research by examining the influence of temporal focus and two different forms of innovation – namely explorative and exploitative innovation. That was done by examining the relationship of temporal focus and innovation with experienced CEOs of small and medium-sized enterprises who have substantial industry experience and pre-existing views which might lead to priming effects through this experience and the specific firm context they are acting in. To set this concern aside, Study 3 uses a sample of participants with various backgrounds instead of experienced managers and a more controlled empirical setting to isolate the decision-making context.

A broader application of this consideration is whether the view of experienced managers and CEOs is generally transferable to entrepreneurs without certain industry experience. More specifically, Study 3 shall provide a robustness test for the findings of Study 2 and whether these

findings can be generalized to entrepreneurs or other decision-makers in general. Accordingly, a broader basis of individuals will be examined in this study.

Therefore, study three examines how temporal focus affects the different forms of innovation – exploration and exploitation. The investigation of this existing research gap is important because decision-makers often have to allocate resources through their decisions and change organizational structures to such an extent that favors a particular form of innovation (Benner and Tushman 2003; Ahmadi et al. 2017). In order to be able to apply the appropriate form of innovation in the situation and to allocate resources correctly, the underlying mechanisms for decision-making must be carefully examined and understood.

Furthermore, the study investigates whether this relationship is contingent on the external environment by manipulating environmental conditions experimentally. An essential factor within the framework of the environmental influences that may affect the decision-making of individuals is environmental dynamism which refers to the degree of instability and unpredictability of the external environment (Dess and Beard 1984; Jansen et al. 2006). To test the suggested relationships, study 3 takes on two survey experiments on Amazon Mechanical Turk with 104 participants in the first and 117 participants in the second experiment.

In particular, the study's aim is to validate the existing research approaches through an experimental research approach and therewith, expand the literature on the influence subjective time perceptions on innovation activities by distinguishing the two different types of innovation, exploitative and explorative innovation.

B Study 1: When entrepreneurs get serial? – A cognitive model on entrepreneurial re-enter after failure

Authors, affiliation, and share of contribution:

David Prinz, Heinrich Heine University Duesseldorf: 90%

Katrin Burmeister-Lamp, EBS Universität für Wirtschaft und Recht: 10 %

Author contributions:

Katrin Burmeister-Lamp and David Prinz developed the model.

David Prinz reviewed the literature, developed propositions and wrote the paper.

Katrin Burmeister-Lamp

David Prinz

1 Introduction

Business failure is a traumatic, life changing and, in most cases, a very costly experience in the personal life of an entrepreneur (Ucbasaran et al. 2013). While some failed entrepreneurs choose to abandon entrepreneurship, others come back from venture failure and find new ventures (Mandl et al. 2016; Hessels et al. 2011). What drives failed entrepreneurs to start again or re-enter entrepreneurship has been among recent interest in the entrepreneurship literature (Hsu et al. 2015; Baù et al. 2016; e.g., Amaral et al. 2011; Jenkins and Wiklund 2012). However, the mechanisms why so many re-enter and become serial entrepreneurs are still new and relatively unexplored (Stam et al. 2008; Baù et al. 2016). A number of scholars therefore recently stated that there is a pressing need for additional theoretical development (Amaral et al., 2011; Baù et al., 2016; Hsu et al., 2015; Sarasvathy et al., 2013). We address this call with this study.

By serial entrepreneurs we refer to individuals who started a venture, sold or closed it and start another in sequential order (Ucbasaran et al. 2006). Serial entrepreneurship is important and a wide-spread phenomenon (Hyytinen and Ilmakunnas 2007; Plehn-Dujowich 2010; Sarasvathy et al. 2013). It has been identified as a driver of economic performance (Westhead et al. 2003; Colombo and Grilli 2005), especially economic growth (Gompers et al. 2010), wealth creation (Scott and Rosa 1996) and as an important source of employment (Westhead et al. 2005).

In this study, we propose a conceptual model to explain re-entry into entrepreneurship after previously failing with a venture. For this purpose, we build up on two prominent intentions theories to explain entrepreneurial re-entry: (1) the Entrepreneurial Event Model (Shapero and Sokol 1982; Shapero 1975) and (2) the Theory of Planned Behavior (Ajzen 1991) and extent these frameworks to the context of venture failure. We examine antecedents and implications of entrepreneurial failure on re-enter intentions.

Experiencing failure can be a drastic and incisive event in the personal life of an entrepreneur. How drastic and incisive this experience is depending on how entrepreneurs perceive the magnitude of failure which in turn may influence the decision to re-enter or to seek regular employment (Ucbasaran et al. 2013; Cope 2011; Singh et al. 2007). Specifically, we argue that the costlier the failure (in terms of economic, psychological and social cost), the lower the perceived feasibility, desirability and the lower the intentions to try again. Moreover, during the process of coping with failure and building intentions to re-enter post business failure, we argue that the relationship between costs of failure and perceptions of feasibility and desirability to re-enter is contingent on an entrepreneurs' attributional style. The attributional style describes how entrepreneurs make sense of what happened during failure and how they interpret causes of failure (Askim & Feinberg 2001; Cardon and McGrath 1999; Shaver et al. 2001). Finally, we consider the propensity to act as a substantial element to the formation of re-enter intentions. When external circumstances may not look as rosy as they might have been in the formation of first-time entrepreneurial intentions, a thinker-or-doer mentality may be the decisive element that leads to re-enter intentions in case of pronounced feasibility and desirability perceptions (Krueger 1993).

Implications of our research suggest psychological mechanisms that explain re-enter intentions post failure. Moreover, we point out implications of our conceptual model for future entrepreneurship, i.e. when a new venture is started after failure. We argue that an entrepreneur's attributional style will influence the sensemaking process and learning from failure. By failing with one's business, entrepreneurs can learn from that experience and use their knowledge post failure for new business ideas (Cope 2011; Sarasvathy et al. 2013; Minniti and Bygrave 2001) which is then in turn mainly responsible that some serial entrepreneurs are more successful than others with their subsequent venture (Kirschenhofer and Lechner 2012).

We contribute to the entrepreneurship, psychological and behavioral literature by examining the impact of failure on future entrepreneurship. Specifically, we complement prior empirical studies on serial entrepreneurship and entrepreneurial failure with a theoretical frame. Our study provides a theoretical framework to the questions why and under which conditions failed entrepreneurs will start subsequent ventures. Thus, it extends our understanding of the entrepreneurial process from failing with one venture to the emergence of another one.

2 Entrepreneurial Failure

2.1 Definitional issues

Failure has been conceptualized in various ways. Past studies often applied the general definition for business failure as the entrepreneur's exit from the business or the "discontinuity of ownership" (see Singh et al. 2007 and Watson and Everett 1996 for a review). However, there is substantial variance in firm exits and failure goes beyond discontinuity of ownership, as an exit does not necessarily imply failure. Reasons for those who discontinue ownership of their successful business could be due to a harvest sale of their firm or the liquidation of their profitable firm due to age or health reasons, divorce, a desired career change or simply because they want to move on to another venture (Wennberg et al. 2010; Ucbasaran et al. 2013). Thus, exit is not a sufficient criterion for failure but rather is failure a specific form of exit (Jenkins and McKelvie 2016).

Only recently Jenkins and McKelvie (2016) saw the need for a study focusing solely on the question what entrepreneurial failure is. They developed a framework to cluster previous studies in which they distinguished the level of analysis (individual vs. firm level) and whether criteria used were objective or subjective (e.g. bankruptcy vs. performance below a self-set

threshold). On the one hand, they called for differentiating firm failure from the failed entrepreneur which had barely been done in research (Cardon et al. 2011). This is important however, as these two levels are often confounded and failure of the firm means not necessarily failure of the entrepreneur and vice versa (Sarasvathy et al. 2013). An entrepreneur can fail in a successful company, for example when the firm is profitable but a self-set threshold for success was not reached (Gimeno et al. 1997). Conversely, a firm can fail, while entrepreneurs having generated personal and social resources such as relationships to customers and capital providers (Sarasvathy et al. 2013; Jenkins and McKelvie 2016).

This study investigates the response of entrepreneurs to a failure at the individual level. However, it is almost impossible to separate a firm from its founder. The human capital of entrepreneurs are key resources for their firms and the firm can become a part of the identity of entrepreneurs (Ucbasaran et al. 2013). Therefore, relevant to a conceptualization of failure at the individual level are both, elements of firm- and individual-level criteria (Jenkins and McKelvie 2016). We use a conceptualization that is closest to an objective individual-level definition because "the conceptualization is relatively broad in scope as it potentially captures objective firm failures such as bankruptcy, failures involving financial loss, and other cases where entrepreneurs perceive that they have failed relative to personal benchmarks and expectations despite the firm being profitable" (Jenkins and McKelvie 2016, p. 182). That means entrepreneurs' expectations have not been met and they dropped out of business due to (but not limited to) the perception of insufficient own performance. Therefore, we apply the definition introduced by McGrath (1999, p. 14) "failure is the termination of an initiative that has fallen short of its [owner's] goals." This includes bankruptcy and insolvency but also business closure due to personal failure. Thus, diverse types of failure are covered which allows our model and conceptual analysis to be of broad relevance for entrepreneurship theory and practice.

2.2 A conceptual model from failure to building re-enter intentions – Perception is what matters

Building on theories of intentions (Ajzen 1991; Krueger and Carsrud 1993; Shapero and Sokol 1982) and attributional style (Heider 1958; Peterson et al. 1982; Weiner 1985) we develop in the following a conceptual model of generating re-enter intentions after entrepreneurial failure. When examining the impact of failure on future entrepreneurial intentions, we first tap on the matter that there is substantial variance in entrepreneurs' individual responses to a similar stimuli, the failure event (Jenkins et al. 2014) and effects of venture failure on entrepreneurs can be quite paradoxical (Ucbasaran et al. 2013). For some is failure the motivation for future success while it leads to depression for other (Askim & Feinberg 2001). However, the effects of failure are more complex. Failing with one's venture is seldom a sudden occurrence and instead a process, which is unlikely to be linear and homogenous for each entrepreneur.

The process from terminating a venture that has fallen short of its owner's goals due up to the beginning of forming new intentions to re-enter can be seen as a journey from taking stock of consequence over coping with what happens, sensemaking and recovery that unfolds over time (McGrath 1999; Cope 2011; Ucbasaran et al. 2013). Thus, when entrepreneurs fail with their business, they go through different stages of processing the failure. This involves at first striking a balance of the immediate consequences of failure – the "aftermath" in the form of financial strains, impact on social relations and emotional distress, i.e. the financial, social and psychological costs of failure (Ucbasaran et al. 2013; Cope 2011). We propose that the immediate aftermath will directly influence the intentions to re-enter. In line with literature on intentions (Ajzen 1991; Krueger and Carsrud 1993; Shapero and Sokol 1982), we suggest that this relationship will be partially mediated through perceptions of feasibility and desirability to re-enter. Moreover, we argue that the relationship between the aftermath and perceptions of feasibility

and desirability to re-enter is contingent upon failed entrepreneurs' sensemaking and how they interpret causes of failure, i.e. their attributional style (Askim & Feinberg 2001; Cardon & McGrath 1999; Shaver et al. 2001). Lastly, we propose that a thinker-or-doer mentality, i.e. the propensity to act, may be the decisive element that directs to re-enter intentions in case of distinctive feasibility and desirability perceptions (Krueger 1993).

Our model is depicted in Figure B-1 and shows the proposed relationships in this study, more precisely the process of how the aftermath of failure influences subsequent stages of the sensemaking and coping processes as well as lastly recovery of the failure with cognitive and behavioral outcomes such as the forming of re-enter intentions (Ucbasaran et al. 2013).

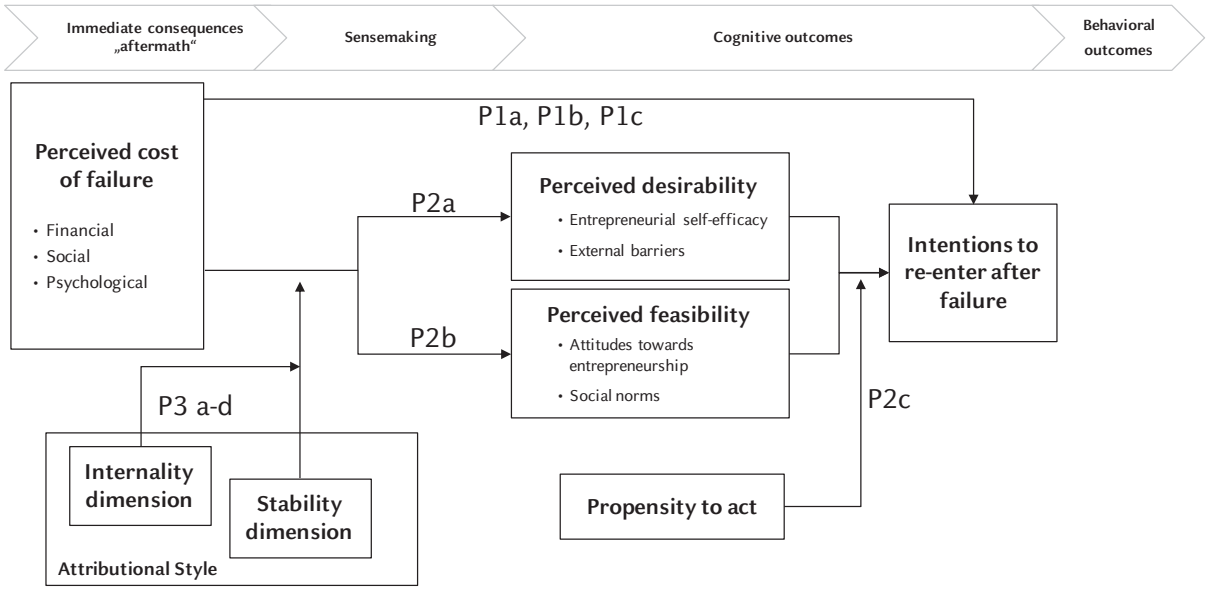

Figure B-1: Conceptual framework for explaining re-enter intentions after failure

3 Entrepreneurial Re-Enter Intentions Post Failure

For an understanding why some people re-enter after a failure and become serial entrepreneurs while others leave the domain of entrepreneurship to seek regular employment, we need to understand the impact of failure on entrepreneurial behavior. Entrepreneurship involves diligent planning and considering and that is why founding one's first venture is regarded as a purposeful and planned behavior (Bird 1992; Schlaegel and Koenig 2014). And for those types of planned behavior, behavioral intentions have been identified as the most accurate predictor to perform a given behavior (Ajzen 1991). Building up a new venture after one has gone through a failure process will most likely be an even more deliberate and planned decisions as the failed entrepreneur went through a lot of thinking during the coping process (Cope 2003; Cope 2011; Singh et al. 2007). This makes a strong case for the investigation of entrepreneurial intentions to re-enter after failure and seems to be the most promising route towards understanding serial entrepreneurship after failing with one's business.

3.1 Theoretical models of entrepreneurial intentions

The evolution of literature on entrepreneurial intention has been rapidly growing in recent years and can be subdivided into two different strands of research (Liñán and Fayolle 2015). The first is based on the Theory of Planned Behavior (Ajzen 1991), shedding light on social-psychological processes leading from attitudes and beliefs to intentions towards a behavior in general. The second is the Entrepreneurial Event Model (Shapero and Sokol 1982; Shapero 1975), which is specific to the entrepreneurship domain and the forming of intentions towards starting a new business.

The Theory of Planned Behavior explains intentions through three factors: (1) Attitude towards the behavior which refers to the degree an individual has a favorable appraisal of the

entrepreneurial behavior, (2) subjective norms, which are perceived social norms that entrepreneurship is an acceptable career path, (3) perceived behavioral control, the perceived ease to 'perform' entrepreneurial behavior (Ajzen 1991; Clercq et al. 2013). Shapero's intention model is specific to the entrepreneurship domain and intentions to start a venture are explained through: (1) the perceptions of feasibility or the degree to which one feels capable of starting a venture, (2) the perception of desirability refers to the personal attractiveness of being an entrepreneur. Additionally, the theory comprises a volitional component, (3) the propensity to act upon opportunities, without which significant actions may not be taken (Shapero and Sokol 1982; Shapero 1975; Krueger et al. 2000).

3.2 An integrated conceptualization of entrepreneurial intentions

The convergence of both literature strands described above has led to further advancement in explaining intentions in the entrepreneurship domain (Liñán and Fayolle 2015). For our model we use an integrated theoretical approach of the two strands of entrepreneurial intentions as a starting point and try to build a bridge between a prior failure experience to a re-building of entrepreneurial intentions, i.e. re-enter intentions.

When comparing the two theories, Krueger and Brazeal (1994) find a considerable conceptual overlap as both theories predict that an individual's capability and readiness explain entrepreneurial intentions (Schlaegel and Koenig 2014). Further empirical research confirmed this overlap and that the proportion of variance in intentions appears to be of little difference between the models using different approaches (Krueger et al. 2000; Peterman and Kennedy 2003). There have been several approaches integrating the two theories into one model, fully or partly integrated (Iakovleva and Kolvereid 2009; Krueger and Brazeal 1994; Liñán and Fayolle 2015; Schlaegel and Koenig 2014).

For the concept of re-enter intentions in our model, we build up on above research and use an aggregated conceptualization similar to Clercq et al. (2013) as this is particularly developed for the entrepreneurship domain. The authors argue that applications of the Ajzen's Theory of Planned Behavior operate through an individual's perception of feasibility- and desirability-driven motivations (Krueger et al. 2000; Fitzsimmons and Douglas 2011; Clercq et al. 2013). Perceived feasibility motivation refers to Ajzen's perceived behavioral control dimension while perceived desirability includes attitudes and subjective norms from the Theory of Planned Behavior (Kolvereid 1996; Krueger and Brazeal 1994). The segregation into perceptions of feasibility and desirability also reflects findings in career choice literature, in which it is indicated that interests in a certain career are formed by whether individual's view themselves as capable to attain a certain outcome and find the career path attractive and desirable (Lent et al. 1994; Betz and Rottinghaus 2006; Clercq et al. 2013). The same logic applies when entrepreneurs have failed with their first business and consider what their next career step will be after the failure. Entrepreneurs weight current options, consciously or unconsciously and update believes about an entrepreneurial career based on the outcome and magnitude of their failure. In this article, we examine the antecedents of feasibility and desirability perceptions in a failure context. This has received only limited attention so far but is important to understand the formation of intentions to become a serial entrepreneur after failing with one's first business.

4 Starting the Sensemaking Process with an Evaluation of the Costs of Failure

As immediate consequences of failure are considered as the starting point of the process which eventually influences future entrepreneurial intentions and behavior (Ucbasaran et al. 2013), we now turn to the question how these costs arise. The aftermath or costs of failure represent

the failure magnitude which depends to a large extend on perceptions (Cope 2011). The costs of failure result in the first stage from objectively accruable costs, such as loss of invested money, loss of business partners through the failure or a possible state of depression. In a second stage, the costs of failure are ultimately the emotional strain resulting from the objectively accruable costs and adverse circumstances entrepreneurs perceive to be in due to their failure. Thus, the costs depend to a large degree on perceptual and chronological occurrences, as they are contextually and situationally unique to each failed entrepreneur. More precisely, this means that if two entrepreneurs failed with their ventures with equal objectively accruable costs, the resulting reactions and perceived costs of failure might be very different, depending on personal circumstances and perceived emotional strain (Jenkins et al. 2014).

Appraisal theory and loss appraisals for instance can provide an explanation for this variance of different reactions of entrepreneurs who face a similar failure event (Jenkins et al. 2014; Folkman et al. 1986). Central to this theory is that subjective evaluations or appraisals lead to varying emotional reactions of individuals to a similar event (Lazarus and Folkman 2015; Folkman et al. 1986). Reactions such as emotional distress and grief are a considerable part of the aftermath and thus, subjective appraisals can be seen as antecedents to costs of failure (Jenkins et al. 2014).

The perception of the costs of failure are, metaphorically speaking, the ruins entrepreneurs are left with immediately after the failure. Depending on these perceptions of failure magnitude, i.e. costs of failure, decision-makers will react accordingly (Ford 1985). The numerous costs of failure can be categorized into three subcategories that affect the entrepreneur on different levels: financial, social and psychological (Ucbasaran et al. 2013; Cope 2011). These costs can be seen as the starting point for the analysis of subsequent sensemaking processes as well as

cognitive and behavioral outcomes such as the forming of re-enter intentions (Ucbasaran et al. 2013). We discuss these costs and their implications in the following.

4.1 Financial costs of failure

In almost any case, failure entails a financial loss for the entrepreneur. That may be in the form of a reduced income, personal debts, opportunity costs for e.g. not being employed elsewhere or for not pursuing another opportunity during that time and the financial resources that are sunk in the failed venture (Shepherd et al. 2009).

While the financial costs are quantifiable in terms of a certain money value, the more interesting issue in terms of the failure magnitude is how these costs are subjectively assessed and absorbed by the entrepreneur (Ucbasaran et al. 2013). How high these perceived financial costs are depending on factors such as family background (in term of wealth) or opportunity costs. For a person from a wealthy family business failure may not be particularly damaging in financial terms while it could well be damaging for another without considerable personal resources. Thus, heterogeneity in family wealth can lead to different financial implications and what may be a large financial loss for one person could be only a little concern for another (Cope 2011). In addition, opportunity costs can differ largely, although the impact on the perceived financial costs can be ambiguous and may vary substantially between individuals. On the one hand, those with more outside alternative may absorb high financial costs more easily (Ucbasaran et al. 2013). On the other hand, from a behavioral perspective higher opportunity costs can lead to more impatience for success and to a more aggressive investment behavior (Arora and Nandkumar 2011). This in turn leads to increased financial costs in the case of failure.

In addition to lost income and opportunity costs, a debt burden and the lost investment from the failed venture can hinder the entrepreneur from a re-enter. For example, George (2005) suggests

that financial slack is important for successful entrepreneurship and if the perceived financial costs of the failure are high, the possibility of investing the resources necessary for future ventures is limited. This implies that high financial costs of failure represent a major barrier to future entrepreneurial activities (Shepherd and Patzelt 2017, p. 68). Therefore, we propose:

Proposition 1a: The higher the perceived financial costs of failure, the lower the re-entry intentions.

4.2 Social costs of failure

Failure entails social costs, i.e. costs that influence personal and professional relationships. On a personal level, it has been found that failure can lead to the breakdown of social ties, friendships and even marriages (Cope, 2011; Singh, Corner, & Pavlovich, 2007). On a professional level, direct implications of failure might not be as severe as on the personal level. Other professionals may "accept that every now and again things don't go well" as one interviewed failed entrepreneur suspects (Cope 2011, p. 612). Some entrepreneurs who failed with their venture, still perceive that they built up a useful professional network which facilitated starting a new venture (Sarasvathy et al. 2013). However, the loss of a venture can destroy major social arenas in which members have spent much of their time and therefore, failure could also lead to the loss of a network due to the cease of mutual obligations (Harris and Sutton 1986).

Personal and professional relationships can also be adversely affected when a failed entrepreneur is socially stigmatized (Simmons et al. 2014). As pointed out by March and Shapira (1987, p. 1413) "Society values risk taking but not gambling, and what is meant by gambling is risk taking that turns out badly". Stigma is a deeply discrediting attribute that reduces an individual "to a tainted, discounted one" (Goffmann 1963, p. 3). Social stigmatization can reduce future employment chances and access to resources such as financial and human capital (Ucbasaran

et al. 2013; Cope 2011; Sutton and Callahan 1987). Costs arise early in the failing process when failure is already anticipated, through fear of being stigmatized, and sum up until the failed venture is ultimately exited (Singh et al. 2015). These social costs may lead to the loss of personal status and identity and to a social disengagement and self-imposed isolation of the failed entrepreneur (Singh et al. 2007; Cope 2011).

The culture in which the failure occurs may have major implication in terms of the social costs (Ucbasaran et al. 2013). Cardon and McGrath (1999) suggest that failures are more likely to be forgiven in individualistic cultures while it can have devastating social impact in collectivistic cultures. For example, while there is a comparatively high social stigma of failure in Japan (Yamakawa et al. 2010) that can even lead to suicide after venture failure (Yamakawa and Cardon 2015), Australia and New Zealand represent the other extreme. There are the high achievers those who are stigmatized and an ambivalence in society about those who succeed so much that they stand out (namely the “tall poppy syndrome”, see e.g. Kirkwood 2007). Even within a country, there are substantial differences of social perception of stigma. Cardon et al. (2011) conducted a study to investigate whether entrepreneurial failure is ascribed to fortunes or mistakes by analyzing major U.S. newspaper. Their analysis found support for social stigma variations within the local area where failure occurs. While failed entrepreneurs from areas where tolerance for failure is high find it easier to startup another venture (Cope 2011), entrepreneurs from high-stigma regions are less likely to re-enter entrepreneurship (Simmons et al. 2014).

Social costs of failure can vary by country, region, family relations and societal group. However, if those social costs are perceived to be high, they put a heavy burden on to the failed entrepreneur. Therefore, we propose:

Proposition 1b: The higher the perceived social costs of failure, the lower the re-entry intentions.

4.3 Psychological costs of failure

Psychological costs of failure manifest itself as a spectrum of issues regarding reduced subjective well-being and emotional consequences of business failure (Ucbasaran et al. 2013; Cope 2011). Entrepreneurship generates considerable emotions (Baron 1998). As entrepreneurs invested enormous resources in their ventures, they are likely to have generated a sense of ownership towards their business (Detienne 2010). This psychological ownership can create somewhat of a connection between entrepreneurs and their ventures (Zhu et al. 2011). This makes it particular hard when they fail with their endeavor and have to walk away from their creation. Or, phrased more drastically by Baron (1998, p. 288): "doing so would almost be akin to disowning one's children – in this case, intellectual rather than biological offspring."

The loss of a venture has been linked to emotional distress and thereby leading to grief, defined as the negative emotional response generated from the venture failure (Jenkins et al. 2014; Shepherd 2003; Shepherd et al. 2009). Grief serves as an umbrella term and characterizes a number of negative emotions such as guilt, anxiety, humiliation, anger, panic attacks, phobias, sadness and forms of depression, capable to trigger behavioral, experiential, and even physiological manifestations (Cope 2011; Singh et al. 2007; Ucbasaran et al. 2013; Shepherd 2003). This grief over the loss of the business can be similar to the loss of a loved one (Shepherd 2003, p. 320). These negative emotions can have a negative effect on the cognition (Shepherd and Patzelt 2017). First, grief may narrow the momentary thought-action repertoire and calls out specific actions tendencies such as to leave the current domain (Fredrickson and Branigan

2005). Second, high grief after failure can have a harmful effect on the commitment to entrepreneurship (Shepherd 2003). Therefore, we propose:

Proposition 1c: The higher the perceived psychological costs of failure, the lower the re-entry intentions.

4.4 Interrelationships among the three dimensions

Besides the single effects of financial, social, and psychological costs, these dimensions can be interrelated and can reinforce each other (Ucbasaran et al. 2013). First, the social costs of failure influence the financials. Singh et al. (2015) found that due to fear of being stigmatized the decision to terminate a failing venture is delayed and entrepreneurs try to cover up signs of failure. This escalation of commitment can lead to avoidance of professional help, investment of more money and thus, to increased financial costs of failure. Furthermore, social stigma has indirect financial implications. If a social stigma is attached to the failure, the entrepreneur may have difficulties to find investors for subsequent ventures or even to find regular employment after failure (Cope, 2011; Singh, Corner, & Pavlovich, 2007). Conversely, financial implications can influence social costs. When the business failure included a bankruptcy of the firm, the institutional setting, particularly in term of the bankruptcy laws has implications for the individual social costs of failure. Bankruptcy laws may also reflect the societal attitudes and norms towards business failure and therewith financial implications can affect the social costs of failure (Ucbasaran et al. 2013). Second, social costs can increase psychological costs. The magnitude of social stigma will affect the psychological costs of failure. If individuals are exposed to social exclusion feelings of guilt and shame will be increased (Tangney 1993). Through shame and embarrassment generated by the perception of other's judgment the failed entrepreneur may amplify psychological well-being in terms of behavioral, experiential, and

even physiological manifestations (Ucbasaran et al. 2013). Third, psychological costs affect social costs. If an entrepreneur experiences high levels of grief, this can lead to more social isolation. For instance, one entrepreneur in the study of Cope (2011) found it hard that his entrepreneurial inventions did not lead to a sufficient return on investment which led him to feelings of guilt and impotence. These kinds of feelings in turn can lead to social distancing and withdrawal (Cope 2011; Singh et al. 2007; Ucbasaran et al. 2013). This breakdown of different costs of failure illustrates that with an increment of these costs there arise many forms of burdens for entrepreneurs and re-enter intentions after failure will be lower (Ucbasaran et al. 2013, p. 164).

5 The Partial Mediation of Perceived Feasibility and Perceived Desirability

Krueger et al. (2000) point out that exogenous influences such as venture failure do not entirely influence intentions or behavior directly. Instead, they also operate through person-situation variables as perceptions of feasibility and desirability. In line with this reasoning we argue that the costs of failure operate in their influence on re-enter intentions at least partly via mediating factors, namely the perceived feasibility and the perceived desirability of re-entering entrepreneurship post failure. As pointed out in the previous section, venture failure can be a significant and traumatic life event. How drastic and decisive the failure experience is depending on perceptions of the total costs of failure, which in turn impact on the perceptions of feasibility and desirability.

5.1 Perceived feasibility of re-entering after failure

The construct of perceived feasibility refers to the degree to which individuals (1) are confident that they are personally capable to re-entering entrepreneurship and (2) consider the possibility to become an entrepreneur again as being feasible (Shapero and Sokol 1982; Schlaegel and Koenig 2014). After experiencing failure, these implied two dimensions are (1) based on ability beliefs within entrepreneurs such as the believe in own competences that they can successfully re-enter, namely a high self-efficacy (Bandura 1997; Krueger 1993). In addition, (2) feasibility perceptions concern issues with external circumstances of the situation as feasible and hence, reasons and burdens to overcome such as liquidity constrains and access to new capital (Shapero and Sokol 1982; Schlaegel and Koenig 2014).

Entrepreneurial self-efficacy. Self-efficacy refers to one's belief in the capacity to successfully engage and perform a certain behavior (Bandura 1977, 1997) and is seen as one of the main antecedents of perceived feasibility (Krueger et al. 2000; Schlaegel and Koenig 2014). It is ascribed as a substantial explanator in the career or employment choice of individuals (Chandler and Jansen 1992; Kolvereid 1996; Segal et al. 2002) and in the formation of entrepreneurial intentions (Zhao et al. 2005; Drnovšek et al. 2010; Chen et al. 1998). As self-efficacy is viewed as task-specific, the construct of entrepreneurial self-efficacy has been suggested (Chen et al. 1998). Entrepreneurial self-efficacy is defined as individuals' belief in their ability to succeed in entrepreneurship situations or tasks (Bandura 1997; Chen et al. 1998). We argue that the costs of failure will impact one's entrepreneurial self-efficacy and therewith entrepreneurial self-efficacy partly mediates the relationship of costs of failure on re-entry intentions. Furthermore, the relationship of costs of failure and entrepreneurial self-efficacy will be contingent upon attributions about the failure. It has been found to be not only a crucial factor for the initiation of the first venture founding but also for serial entrepreneurship intentions. One's self-

efficacy may be altered through attributions concerning a preceding success or failure event (Gist and Mitchell 1992). For example, Hsu et al. (2015) suggest that entrepreneurial self-efficacy is a good predictor why successful entrepreneurs re-enter into entrepreneurship but is less well suited to do same for failed entrepreneurs as failure is likely to decrease self-efficacy. The effect of failure on entrepreneurial self-efficacy is also pointed out by Shepherd (2003, p. 325): "the loss of a business likely lowers an individual's entrepreneurial self-efficacy and, therefore, the motivation to be self-employed again". Hence, prior entrepreneurial outcomes affect entrepreneurial self-efficacy (Gist and Mitchell 1992). Although there might be boundary conditions as the relationship of prior experience and its influence on self-efficacy is complex and contingent on several factors in process of attribution and sensemaking with experiencing (Gist and Mitchell 1992; Hsu et al. 2015). For the immediate consequences, i.e. perceived costs associated with failure we expect a reduction in entrepreneurial self-efficacy. For example, a failed entrepreneur who experiences high levels of grief and social stigma, is likely to question his or her beliefs in the own competence of being successful with a re-start. The belief in own competence, i.e. self-efficacy, occurs through positive feedback on own actions. In other words, entrepreneurial self-efficacy increases when entrepreneurs received positive feedback on their actions. Such feedback can occur in different forms: a successful company, a successful exit, satisfaction with own actions and the resulting consequences. Hence, the crucial point here is that if an entrepreneur evaluates something as an entrepreneurial failure, it means that the disadvantages exceed the advantages from a business exit, and he is not satisfied with the outcomes as personal income goals are not met or insolvency or bankruptcy occurs. These negative evaluations are likely to lower the belief in performing entrepreneurial actions successfully, i.e. entrepreneurial self-efficacy.

External barriers. However, financial costs associated with business failure may also affect the perceived feasibility beyond the notion of entrepreneurial self-efficacy. New ventures are predominately funded by personal savings (or those from friends and family) and loans by banks, guaranteed with personal assets (White 2001). Thus, if entrepreneurs have high debt burdens due to their failure or if they secured business loans with personal assets, they are likely to encounter personal financial strains and therewith they will perceive a re-enter as much less feasible due to liquidity constrains (Jenkins and Wiklund 2012). Additionally, the social costs of failure often bring barriers with it such as a signaling to financiers. As stated in the costs of failure section, if the failure has a high level of social stigma attached to it, the entrepreneur may have it difficult to find investors or other capital providers for subsequent ventures (Cope 2011; Singh et al. 2007).

Arguably, the higher the perceived costs of failure, the more difficult it becomes to process the failure financially, socially and psychologically. The failure experience will reduce the perceived feasibility of re-entering, which again reduces the intentions to re-enter. Hence, we derive proposition 2a:

> *Proposition 2a: Perceived feasibility mediates the relationship between perceived costs of failure and re-enter intentions insofar as the higher the perceived costs of failure, the lower the perceived feasibility, which again lowers the re-enter intentions.*

5.2 Perceived desirability of re-entering after failure

Perceived desirability in this context refers to the attractiveness towards the re-enter into entrepreneurship and that consequences of a re-enter are desirable despite a prior failure (Clercq et al. 2013). It functions as the motivational factor that transforms favorable attitudes and norms into re-enter intentions. The construct subsumes the two attractiveness factors from the Theory

of Planned Behavior, "attitude towards the behavior" and "subjective norms" (Krueger and Brazeal 1994).

Attitudes to re-enter. The concept of attitude taps on perceptions of what an individual considers desirable and is the predisposition to respond in a generally favorable or unfavorable manner to start a new venture (Robinson et al. 1991; Ajzen 1982; Krueger and Brazeal 1994). Attitudes are developed reasonably from beliefs individuals hold about a re-enter. This happens through associating the re-enter with attributes such as certain outcomes or to the cost incurred by performing the re-enter. Individuals learn to favor behaviors they believe have desirable outcomes and form unfavorable attitudes they associate with undesirable consequences (Ajzen 1991). In this fashion, attitudes are seen as relatively malleable and dynamic, changing across situations through interactive processes with the environment (Chaiken 1987; Robinson et al. 1991). The rate of change in attitude varies depending on the intensity and valence of the experience that influence a particular attitude (Robinson et al. 1991).

In case of a costly failure experience the drivers of a change in attitude – intensity and valence – are given. However, it remains the question towards what attitudes are changing when there are high costs of failure. To answer this, we need to ascertain the impact of failure on antecedents of attitudes, which are beliefs individuals hold about a specific behavior (Ajzen 1991; Fishbein and Ajzen 1977). Prior beliefs entrepreneurs had when they formed attitudes towards founding their first business may have fundamentally changed through a failure experience and this can significantly affect their attitudes towards entrepreneurship as a career choice (Politis and Gabrielsson 2009). In particular, when entrepreneurs have experienced a costly failure with high levels of financial, social and psychological strains, the failure experience can be an intense and life changing event that fundamentally changes their beliefs about entrepreneurship (Cope 2011; Ucbasaran et al. 2013). It appears likely that high costs of failure lead to the

formation of unfavorable attitudes toward a re-enter as this is associated with undesirable consequences (Ajzen 1991).

Subjective norms of a re-enter. The concept of subjective norms consists of normative beliefs regarding expectations of important reference groups and the motivation to comply with the expectations of the relevant persons (Ajzen 1991). Normative beliefs are tied to perceived expectations of people or subgroups important to the entrepreneur and what they think of a re-enter. These expectations can manifest itself in social pressure, family wishes, and friends' or partners' wishes. The strengths of subjective norms are driven by normative beliefs weighted by the motivation to comply with such norms and it can be thought of as a concept that subsumes perceptions of extra-personal influences on the decision maker (Krueger and Brazeal 1994). Subjective norms operate by its influence on perceptions of desirability (Krueger et al. 2000; Schlaegel and Koenig 2014; Ajzen 1991). When failed entrepreneurs perceive that relevant others think positively about a re-entry, starting over again will appear more desirable and given the motivation to engage with subjective norms, this will encourage the failed entrepreneur to form favorable perceptions regarding the re-enter intention. In contrast, if relevant others have mainly negative thoughts on a re-entry, it recreates social pressure that lowers perceptions of desirability towards a re-entry behavior (Schlaegel and Koenig 2014).

Subjective norms are most likely to be affected by the social costs of failure as well as by its interrelations with financial and psychological costs. When personal and professional relationships have suffered due to the failure, entrepreneurs do know that these important referent others view failure negatively. That may be on a personal level the spouse, relative or children; on a professional level, the former business partners; or on macro level, the community or culture the entrepreneur lives in. High costs of failure may imply unfavorable views of relevant others in terms of a re-entry as they have experienced the severe negative consequences an

entrepreneurial failure can entail (Ucbasaran et al. 2013). Examples for this could be a spouse who experienced that entrepreneurship can be time intense and still did not bring the expected return or even a negative one. It may appear natural that in such a case the spouse is not in favor towards a re-enter and instead prefers regular employment as career alternative. On the macro level, it can be the community or country, which attaches high levels of stigma to failure or has harsh bankruptcy laws that may let entrepreneurs perceive a re-enter after failure is seen as unfavorable in this community. In contrast, if parents or friends are entrepreneurs, may even also have previously failed with a venture and became successful in their next try, normative beliefs of a re-enter could be perceived as more favorable. Prior exposure in an entrepreneurial environment is associated with a positive influence on subjective norms of further pursuing an entrepreneurial career path (Zapkau et al. 2015). However, prior entrepreneurial exposure might mitigate the effect of failure on subjective, it seems reasonable to assume that relevant others would perceive a re-enter as more favorable if the consequences of ventures were moderate. If the costs of failure were high and the failed entrepreneur suffers from depressions and private insolvency even tolerant relevant others might not favor a re-enter in this situation.

Although the strengths of the relationship of costs of failure and subjective norms are dependent on variety of factors outside of the entrepreneur, the above argumentation led conclude that high costs of failure influence subjective norms negatively. Hence, we propose:

> *Proposition 2b: Perceived desirability mediates the relationship between perceived costs of failure and re-enter intentions insofar as the higher the perceived costs of failure, the lower the perceived desirability, which again lowers the re-enter intentions.*

5.3 Propensity to Act

In comparisons to the Theory of Planned Behavior, the Entrepreneurial Event Model has an additional element to intentions, the propensity to act. Shapero (1975; 1982) conceptualized propensity to act as relatively stable dispositional trait which reflects a volitional variable to intentions and can be seen similar to willpower (Krueger 1993). Entrepreneurial thinking and well-formed intentions should contain some propensity to take action upon new opportunities as individuals are unlikely to form serious intentions towards the behavior of starting a venture without perceiving a likelihood of taking action to actually perform the behavior (Krueger et al. 2000; Krueger 1993; Summers 2000; Bagozzi and Yi 1989). This particularly accounts for phenomena such as the many nascent entrepreneurs who then never start their intended businesses (Reynolds 1994; Kautonen et al. 2015) or on the contrary, those who start a business but had little intentions to so a few years before (Katz 1994).

In empirical studies, propensity to act is often captured by locus of control although this has not proven fruitful in predicting entrepreneurial intentions. As a recent meta-analysis states locus of control "might fail to capture the specific features of the propensity to act" (Schlaegel and Koenig 2014, 315 f.). Propensity to act represents a concept, deliberated on the intention and conceptually depends on control perceptions, i.e. the desire to gain control by initiating and maintaining goal-directed behaviors (Krueger et al. 2000; Krueger and Brazeal 1994). Hence, it can be seen as a propensity for a proactive behavior, which might capture more precisely what Shapero had in mind (Summers 2000, p. 34). A prototypic proactive person is described as "one who is relatively unconstrained by situational forces and who effects environmental change" (Crant 1996, p. 43). This personality trait is the primary difference between the Entrepreneurial Event Model and the Theory of Planned Behavior and may be a uniquely required feature in entrepreneurial intentions (Krueger et al. 2000). The propensity to act seems to be

especially material after venture failure, as there can be a variety of situational forces and barriers an entrepreneur needs to overcome before he or she is capable to re-enter. As Summers (2000) argues, new ventures are neither forced into existence, nor is the venture creation process the passive result of external conditions (Bird 1992). Re-entering entrepreneurship is a deliberated and planned result of acting upon opportunities that influences the environment in such a way as to allow the re-entering process. Hence, intentions to re-enter are determined by one's desire to take actions that influence the environment in a proactive way (Crant 1996; Bateman and Crant 1993). In that manner, we consider the propensity to act as a substantial element to the formation of re-enter intentions, in particular in the face of failure. When external circumstances may not look as rosy as they might have been in the formation of first-time entrepreneurial intentions, propensity to act may be the decisive element that lead to re-enter intentions in case of pronounced feasibility and desirability perceptions. Krueger (1993) suggests that propensity to act might impact the influence of perception of feasibility and desirability on intentions. Thus, instead of a direct antecedent of intentions, propensity to act is better viewed as moderating influence (Krueger 1993). Hence, we propose:

Proposition 2c: Propensity to act moderates the relationship of i) perceived desirability and ii) perceived feasibility and re-enter intentions. The higher the propensity to act in individuals, the more pronounced the positive link between i) perceived desirability and ii) perceived feasibility and re-enter intentions.

6 The Moderating Effect of Attributional Style

Originally proposed by Heider (1958), attribution theory intents to model the process by which individuals try to explain causes of behavior and events they both observe and that have happened to them. Most individuals seek explanations for why events in the past, whether good or

bad, happened the way they did. People act as "naïve psychologists" in trying to ascertain cause and effect. In other words, causal attributions answer the "why" question, such as "Why did I fail with my venture?" and through this process, it gives individuals the feeling of controlling and being able to predict their environment (Heider 1958; Kelley 1967; Weiner 1985). These questions are the beginning of sensemaking with what happened. Sensemaking is an interpretative process in which entrepreneurs assign meaning to occurrences in conjunction with action (Yamakawa et al. 2013; Gioia and Chittipeddi 1991). Entrepreneurs structure previous failure through this sensemaking and interpretation, which involves retrospectively linking what has happened to them to possible causes (Yamakawa et al. 2013; Ford 1985). Attributions of causes of the failure represents a variant of sensemaking (Ucbasaran et al. 2013).

Prior research in entrepreneurship confirms the importance of attribution theory to entrepreneurial activities such as becoming a novice entrepreneur (Shaver et al. 2001) or predicting persistence in the new venture creation process (Gatewood et al. 1995). Although individuals may see the reasons for failure as more of a combination of different factors that play together than a single cause, attribution theorists argue that causes can be arrayed on different dimensions that form an attributional style Peterson and Seligman (1984). The construct of attributional style refers to the habitual and characteristic manner in which individuals explain causes of events (Martinko et al. 2007). Attribution theorist argue that especially with uncontrollable and unfavorable events such as business failure, there is a relatively stable way in which individuals attribute those events habitually throughout their lives (Askim & Feinberg 2001; Burns and Seligman 1989; Peterson et al. 1993; Abramson et al. 1978).

Weiner (1985, 1986) applied the attributional style to achievement situations such as pursuing an entrepreneurial career and operating an own venture. Building up on this research, Askim & Feinberg (2001) propose that an individual's attributional style will help explain outcomes in

the failure of an entrepreneurial venture. Weiner proposes several dimensions of the attributional style, among which two of them are most relevant for explaining re-enter intentions after business failure: the locus of causality and stability (Askim & Feinberg 2001). The locus of causality dimension embodies whether the entrepreneur's perception of the cause of failure is within the entrepreneur or lays on outside forces as the environment or situation. Internal attributions include ability (aptitude) and strategy or effort since they constitute characteristics of the person. Task difficulty and chance (luck) are dominant external or environmental determinants of outcomes. The stability dimension indicates the relative duration, which is attached to a cause. The dimension ranges from stable to variable (Graham 1991). The locus and stability dimensions combined yield in the category in which the individual habitually attributes failure events. The possible combinations and their implication on entrepreneurial motivation post-failure will be discussed below.

6.1 Helplessness condition

When entrepreneurs are distinct on the internal and stable dimensions of their attributional style, they will seek reasons for failure in their ability. Such a mindset among these respective entrepreneurs produces a feeling of helplessness (Dweck and Leggett 1988). They may feel the appropriate skills were not possessed to start the business in the first place and to manage it successfully and that this will not change in the near future (Askim & Feinberg 2001). If entrepreneurs ascribe the failure to personal inadequacy, their levels of guilt and shame increase which results in self-blame (Askim and Feinberg 2001). This self-blame may not only amplify the influence of social and psychological costs of failure, this can also lead to lower feasibility and desirability perceptions as entrepreneurs feel personal responsible for the occurred damage. This sense of helplessness increases the perceived influence of the failure so that consequences

in terms of costs of failure will diminish entrepreneurs' beliefs in their ability to undertake a specific task successfully in the future and thus, entrepreneurial self-efficacy levels (Bandura 1991; Cardon and McGrath 1999; Silver et al. 1995). This in turn directly relates to a lower perception of feasibility to re-enter. Individuals with a strong internal-stable attributional style may view achievement situations such as their performance as an entrepreneur as tests or measures of competence and seek in these situations to be judged competent or incompetent (Dweck and Leggett 1988). Transferred to the entrepreneurial context, persons may try founding a venture but when they perceive strong negative feedback, their desirability of repeating this behavior is easily diminished.

Ironically, although they blame themselves for the failure in private, in public they may well cite the failure on market conditions, a co-founder's inability or other external reasons to divert attention away from them (Dweck and Leggett 1988; Askim & Feinberg 2001). Particularly, with high financial and social costs of failure, the failed entrepreneurs seek to adopt a defensive posture, devaluing the task and expressing boredom or disdain towards it to. This results in declined motivation and in distancing from starting over again (Dweck and Leggett 1988). This reaction can be interpreted as a strong motivation to comply with social norms and thus, the influence of subjective norms plays a major role here for desirability perceptions. In addition, this devaluing of the task could lead to a change in attitude towards re-enter intentions. Especially since the malleability of attitude is depending on the magnitude of the failure experience (Robinson et al. 1991), we expect that incurred costs of failure will have a much stronger negative effect on the perception of desirability in the helplessness condition.

Arguably, attributional style moderates the relationship between perceived (social, psychological, financial) costs of failure and perceived desirability and perceived feasibility. We derive proposition 3a:

Proposition 3a: An internal-stable attributional style moderates the relationship of perceived costs of failure on perceptions of desirability and feasibility insofar that it strengthens the negative link between perceived cost of failure and i) perceived desirability and ii) perceived feasibility.

6.2 Mastery condition

A distinction on the internal and unstable dimensions in attributional style on the other side may dampen the effect of costs of failure on perceptions of feasibility and desirability. Individuals seek ascription for causes of failure in a lack of effort or an inadequate strategy (Seligman 1991). Rather than reacting helpless, unsolved problems are viewed as challenges and entrepreneurs become motivated to solve them. Therefore, reasons here are also seen internally but perceived as changeable if only their effort will be increased, or the strategy is adapted. Such a condition is associated with redoubling efforts in an attempt to master the situation (Askim & Feinberg 2001; Dweck and Leggett 1988). Persons in this condition are concerned with increasing their own competence and feel the adequacy of their present ability level is unimportant as they put emphasis on development. As negative feedback through failure is not ascribed to one's own competence but rather used to improve one's ability, entrepreneurs will use effective strategies to solve problems and remain optimistic despite high costs of failure (Askim & Feinberg 2001).

We expect that perceptions of feasibility in this condition are much less affected by increasing costs of failure. If entrepreneurs feel that mistakes that led to failure can be avoided if they exert themselves or at least if they know what mistakes are to avoid, their levels of entrepreneurial self-efficacy believes will be much less affected by a costly failure and instead, they will set themselves strategies to achieve this. Contrary to a helplessness reaction, mastery-oriented

individuals are less influenced by subjective norms and are more likely to pursue learning goals instead of using them to be judged competent (Dweck and Leggett 1988). They persist in challenging situations, attempting to extend their skills and thus, strive to enhanced mastery (Dweck and Leggett 1988; Gist and Mitchell 1992). This implies that entrepreneurs in this mastery-condition do not seek to prove their ability but rather to improve it (Dweck and Leggett 1988), the negative flavor of failure is dampened and a positive attitude towards entrepreneurship is likely to be maintained (Politis and Gabrielsson 2009; Cave et al. 2001).

The distinction on the stability dimension seems to make an important difference in terms of perceived feasibility and desirability to re-enter. Although entrepreneurs tend to ascribe the reasons for the failure internally, they feel that those causes are changeable if only they put in more effort or adapt the strategy. They will try to maximize their attainment in the long run, so we propose they sustain high feasibility and desirability perceptions despite high costs of failure. Therefore, proposition 3b follows:

> *Proposition 3b: An internal-unstable attributional style moderates the relationship of perceived costs of failure on perceptions of desirability and feasibility insofar that it weakens the negative link between perceived cost of failure and i) perceived desirability and ii) perceived feasibility.*

6.3 Victim-of-circumstances condition

In the external-stable attributional style condition, entrepreneurs will seek causes for failure in the difficulty of the task and blame it on permanent outside reasons. The reasons are seen in a fatalistic manner, i.e. beyond their control and as not changeable in the near future. Examples can be failure attributions to governmental actions, demographic shifts or the difficulty of being successful with entrepreneurship in general (Ford 1985; Askim & Feinberg 2001). Thus,

individuals see causes in unfavorable outside sources and prefer to be a victim of environmental circumstances instead of seeking responsibility within them-selves (Zacharakis 1999). Influences on feasibility and desirability perceptions in this condition are not as clearly derivable from the literature as entrepreneurs do not seek the causes within themselves and at the same time believe the causes to be permanent. While for example Yamakawa and Cardon (2015) argue that external-stable attributions lead to a sense of helplessness, a meta-analysis conducted by Sweeney et al. (1986) found no significant relation between task difficulty attributions and helplessness. It could be argued that because of the long time required to change the external permanent causes, if possible at all, more radical behavioral changes are expected and with high costs of failure an abandonment from the domain (i.e. from entrepreneurship) is the most likely outcome (Ford 1985). In addition, as for instance environmental conditions are seen as unlikely to change any time soon the interaction with cost of failure is expected to be strong on desirability perceptions, in particular on the attitude towards re-entering. Drawing on goal theory, it is implied that more difficult tasks can increase desirability of a certain behavior (Locke and Latham 2002). However, Baron et al. (2016) found that when goals are appearing too difficult to attain this generates discouragement and lowered perceptions of attraction towards the behavior. As business failure provides a clear signal that obstacles are currently too difficult to overcome, we suggest that in this condition the higher the costs of failure the more difficult the perception of barriers for a re-entry and thus, the lower re-entry intentions. Following from that, we derive proposition 3c:

Proposition 3c: An external-stable attributional style moderates the relationship of perceived costs of failure on perceptions of desirability and feasibility insofar that it strengthens the negative link between perceived cost of failure and i) perceived desirability and ii) perceived feasibility.

6.4 Self-serving condition

Distinct on the external and unstable dimensions, this is what Seligman (1991) called learned optimism (Krueger et al. 2000). Entrepreneurs will tend to ascribe their business failure to chance or bad luck and hence, seek reasons in causes such as market conditions, competitors' actions, shortages of resources or changes in consumer demand they perceive that this happened by chance and that they could have barely predicted such an outcome. While these external and unstable causes for the failure are augmented, ability attributions in this condition are discounted in a way that self-esteem is protected (Tice 1991; Weiner and Kukla 1970). Psychological literature from depression research suggest that a combination of unstable and external attributions is the healthiest attributional style as the confidence remains intact (Miller and Ross 1975; Mezulis et al. 2004). However, literature also highlights that in a pronounced external-unstable attributional style a self-serving bias may occur (Zuckerman 1979; Miller and Ross 1975). This bias can lead failed entrepreneurs to ignore past situations and experiences when making predictions about future outcomes as causes for failure were beyond their control and as well seen as due to pure luck (Baron 1998). These self-serving attributions are linked to overconfidence (Libby and Rennekamp 2012), i.e. the tendency to overestimate the accuracy of one's predictions (Simon and Houghton 2002). This in turn is associated with over-entry in new markets (Camerer and Lovallo 1999) and the escalation of commitment or in other words 'throwing good money after bad' (McCarthy et al. 1993; Staw and Ross 1989). The implications are on the one hand that overconfidence is partly responsible for failure in the first place and that costs of failure might be much higher. On the other hand, when failed entrepreneurs remain high in confidence and entrepreneurial self-efficacy after failure this likely leads to a development of financial, social and psychological resilience that will dampen any effects of costs of failure on feasibility and desirability perceptions (Hayward et al. 2010).

Therefore, in the self-serving condition, we would expect a weakened impact of the failure magnitude on feasibility and desirability perceptions. Therefore, we derive:

Proposition 3d: An external-unstable attributional style moderates the relationship of perceived costs of failure on perceptions of desirability and feasibility of a re-enter insofar that it weakens the negative link between perceived cost of failure and i) perceived desirability and ii) perceived feasibility.

We argue in line with attributional theorist that individual differences in the interpretation of experienced failure can be explained through their attributional style (Abramson et al. 1978). We conclude that the more distinct entrepreneurs are on the stability and internality dimension, the stronger we expect the moderating effect of attributional style to be and vice versa (the conditions resulting from different combinations are depicted in Figure B-2). The most interesting contribution of the attributional style as a moderating effect of a failure experience and antecedents of re-entry intentions seems to lay upon the stability dimension. When entrepreneurs tend to attribute the outcome to permanent causes, they believe failure is likely to happen to them again, no matter what they do. Contrary, when their attributional style is stronger pronounced on the unstable side of the dimension, entrepreneurs do not believe as much in this carryover effect and are thus not as affected in their feasibility and desirability perceptions as with a stable attributional style (Bandura 1997).

		Locus of causality	
		Internal	External
Stability	Stable	Helplessness condition	Victim of circumstances
	Variable	Mastery condition	Self-serving condition

Figure B-2: Moderating conditions of attributional style for explaining failure

7 Discussion

Despite the acknowledged role of serial entrepreneurs as a driver of economic performance (Westhead et al. 2003; Colombo and Grilli 2005) and economic growth (Gompers et al. 2010), wealth creation (Scott and Rosa 1996) it has largely been overlooked so far what drives entrepreneurs who failed with their first business to start again and become serial entrepreneurs. This article has synthesized available research from management, entrepreneurship and psychology into a conceptual framework to enhance our understanding of entrepreneurial failure and cognitive processes that form re-enter intentions. We make a first step in explaining re-enter intentions of previously failed entrepreneurs with our conceptual model. The perception and interpretation of what happened is what we consider as the decisive element of coping and sense-making with failure. The aftermath manifests itself in form of financial, social, and psychological costs of failure which in turn influences the formation of re-enter intentions (Cope, 2011; Singh et al., 2007; Ucbasaran et al., 2013). As the integrated model of entrepreneurial re-enter intentions suggests, this mechanism will be mediated by perceptions of feasibility and desirability to re-start.

Moreover, we consider the propensity to act as a substantial element to the formation of re-enter intentions. When external circumstances may not look as rosy as they might have been in the formation of first-time entrepreneurial intentions, a thinker-or-doer mentality may be the decisive element that leads to re-enter intentions in case of pronounced feasibility and desirability perceptions (Krueger 1993).

Finally, during the process of coping with failure and building intentions to re-enter post business failure, we argue that the relationship between costs of failure and perceptions of feasibility and desirability to re-enter is contingent on an entrepreneurs' attributional style. The attributional style describes how entrepreneurs make sense of what happened during failure and how

they interpret causes of failure (Askim & Feinberg 2001; Cardon & McGrath 1999; Shaver et al. 2001). In line with prior literature, we distinguish between two dimensions of one's attributional style: (1) locus of causality and (2) stability. We theorize that combinations of both attributional dimensions will lead to diverging reactions for a similarly perceived failure event. For entrepreneurs whose attributional style belongs to the *helplessness or victim-of-circumstances condition*, the costs of failure will have an amplified negative influence of subsequent perceptions of feasibility and desirability to re-enter thereby lowering re-enter intentions. Contrary, entrepreneurs attributing in line with the *mastery or self-serving condition* will discount previously experienced costs of failure, which in turn will increase feasibility and desirability perceptions of a re-enter and finally re-enter intentions. In the following, we discuss implications of our model for future entrepreneurship and state future research opportunities.

7.1 Implications of our conceptual model for serial entrepreneurship

Although certainly not desirable, failure can be a "stepping stone" to new opportunities and thus, to serial entrepreneurship (Amaral et al. 2011; Sarasvathy et al. 2013). Accordingly, it is important to understand the mechanisms that encourage and promote entrepreneur's re-entry intentions and recent scholars undermined the pressing need for additional theoretical development (Amaral et al., 2011; Baù et al., 2016; Hsu et al., 2015; Sarasvathy et al., 2013). Previous research considers in terms of failure and re-entry the aspects perceived cost of failure, attributional style, and intentions to re-enter separately and not in any combined model (e. g. Cope 2003; Cope 2011; Higgins and Hay 2003; Jenkins 2012; Jenkins and Wiklund 2012) and this study is the first bridging different aspects into one conceptual model. Therewith, this paper provides initial insights into possible links and implications arising from the combination of the

above stated research topics that may shed light on the mechanisms why failed entrepreneurs re-enter and become serial entrepreneurs (Stam et al. 2008; Baù et al. 2016).

Specifically, our research model provides a conceptual framework on the psychological mechanisms leading to re-entry intentions after entrepreneurial failure. In the following we discuss beyond that implications of our model, concretely as to when a founder has learned from prior failure. Since learning from experiences of failure can be an essential element for a successful re-entry (Minniti and Bygrave 2001; Parker 2009), specifically the attribution of causes of the failure provides relevant implications for practice as to how entrepreneurs can learn from the experience of failure and which psychological mechanisms can lead to learning effects and re-enter intentions.

An entrepreneur's attributional style influences not only the formation of re-enter intentions but has also implication for future entrepreneurship, i.e. when a new venture is started post failure. Research on entrepreneurial failure has pointed out that failure can be an important learning source for entrepreneurs and that they could benefit from it through learning from the experience (Cope 2011; Sarasvathy et al. 2013; Minniti and Bygrave 2001; Ucbasaran et al. 2013; Sitkin 1992). Failure can provide a unique base to gain knowledge that could not be obtained from success (Rerup 2005). When entrepreneurs are still motivated after their failure, i.e. have high re-enter intentions and learned from past mistakes, they may have a revitalized awareness of their abilities and accumulated human capital through the learning from mistakes (Cope 2011, p. 620). These learning effects are then in turn mainly responsible that serial entrepreneurs are on average more successful than novice entrepreneurs (Kirschenhofer and Lechner 2012). There has been a debate whether all entrepreneurs learn equally from mistakes and the mechanisms that influence whether entrepreneurs have learned from failure are still poorly understood (Cope 2011; Shepherd 2003). As Nielsen and Sarasvathy (2011, p. 4) put it "the mere

fact of failing did not result in learning effects" which means that the positive effects of learning do not come by itself (Shepherd 2003) and prior failure does not automatically lead to future success (Green et al. 2003).

Learning is seen as a process through which failed entrepreneurs experience, reflect, contemplate, and act (Bailey 1986). Therefore, learning as a process brings meaning to the failure experience through contemplation and reflection (Yamakawa and Cardon 2015; Marsick and Watkins 2001; Rae and Carswell 2000). Particularly unexpected and life changing events such as venture failure can provide a greater stimulus for contemplation and reflection that can lead to high-level entrepreneurial learning (Cope 2005; Jarvis 1987; Yamakawa and Cardon 2015). For example, Cope (2011, p. 617) finds that the importance for improvement after failure lies "in the ability to challenge current practices by drawing attention to previously overlooked inconsistencies; fueling an "unfreezing" process in which old ways of perceiving, thinking and acting are shaken and new ways accommodated". Given, the failed entrepreneur decides to re-enter and everything else being equal, only when the entrepreneur is able to apply the lessons from the failure subsequent performance can improve.

In order to learn from failure, one has to indulge in critical self-reflection which challenges personal assumptions and behaviors and the entrepreneur needs to reflect and think about the causes of why a failure has occurred (Mezirow 1991; Sitkin 1992). That is why the way entrepreneurs attribute the causes of failure may have crucial implications for learning and achieving success upon previous failures (Ucbasaran et al. 2013; Shepherd 2009). Entrepreneurs can learn from their failure once they can use information about why their prior ventures failed to revise existing believes and knowledge of how to effectively manage a business (Ucbasaran et al. 2013; Shepherd 2003). This contemplation may be influenced through the attributional style of entrepreneurs – i.e. how they selectively focus on certain aspects of the experience.

When entrepreneurs have a tendency to attribute failure to personal inadequacy, they are in a state of helplessness (Abramson et al. 1978). The entrepreneur does not involve in effective sensemaking and instead, is trapped in spiral of negative feelings and emotions (Dweck and Leggett 1988; Abramson et al. 1978; Peterson et al. 1993). As Shepherd's (2009, 2003) conceptual works pointed out failed entrepreneurs must first overcome the loss of the business and deal with distinctive grief recovery. These high levels of self-blame and negative emotions (grief) however draw the entrepreneur away from constructive recovery which in turn can obstruct learning from their experience (Ucbasaran et al. 2013) and thus, would be anticipated with a lower subsequent performance.

Entrepreneurs in the mastery condition on the other side are much more likely to engage in this constructive recovery processes. When they attribute failure to internal and unstable causes entrepreneurs use effective strategies to overcome their loss and focus on improving their abilities (as argued in the motivational section), they challenge their current practices (Cope 2011) and are thus, lead to more constructive behavior than other forms of attributions (Homsma et al. 2007). This condition is associated with redoubling efforts level in an attempt to “master” the situation (Askim & Feinberg 2001; Dweck and Leggett 1988) to apply what is learned from past mistakes. Providing empirical evidence, Yamakawa et al. (2013) focus on the relationship between attributions, learning and performance and found that a higher growth in subsequent ventures is more likely when entrepreneurs blame themselves for the failure. As explanation, they state that through internal attributions entrepreneurs reflect what went wrong. Thus, reflection on internal attributions is more likely to impact subsequent venture growth via learning. While this finding relates to the locus of causality dimension of attributional style, in a further study with the same data set, Yamakawa and Cardon (2015) theorized with the stability dimension and used internal and unstable attributions to explain the positive learning and performance

effect. That is in line with the reasoning that an internal-unstable attributional style could lead to more learning from failure.

Entrepreneurs who tend to ascribe failure to external reasons are in general not as prone to be affected on their personal levels as they seek the blame for the failure in outside forces. This might not trigger the processes of critical self-reflection which challenges personal assumptions and behaviors (Homsma et al. 2007). When it is believed that the failure is solely due to external factors are also less likely to revise their mental models and therefore, they have no need to change their behaviors (Jenkins 2012; Yamakawa and Cardon 2015). As a result, little learning can occur and thus, their subsequent performance is not likely to be any different. We believe that is even more the case for those in a self-serving condition than for those in the task-difficulty condition. When entrepreneurs are blaming too difficult outside conditions for their failure, they are at least conscious about the highly complex environment in a venture context. There might be a chance that they recapitulate what has gone wrong and eventually might reflect critically what could they have done better. Those in a self-serving condition on the contrary are not assumed to indulge in such a reflecting behavior. They maintain their high levels of (over-)confidence despite failure provided them with a signal that something clearly went wrong, and that can further decrease decision quality (Ucbasaran et al. 2013; Hayward et al. 2010).

Those in with an internal-unstable attributional style are those who most likely to have gained the most out of failure. As they are also likely to re-enter entrepreneurship, for them failure might actually be the route to success. Entrepreneurs in the helplessness condition are those who probably the least concerned about learning from mistakes, as they need time to restore their self-esteem and for emotional healing. For those with a tendency to attribute external, learning is not likely to occur. But as those in a self-serving condition are quite likely to re-

enter after failure but do not seem to learn from it, they might represent a threat to future investors, shareholders and co-founders.

In summary, while a helplessness and victim-of-circumstances condition seems to hinder a re-entry, a mastery reaction and the self-serving condition appear to be a steppingstone for serial entrepreneurship post failure. Entrepreneurs in the mastery condition are most likely to have learned the most out of a failure and therefore, entrepreneurs in this condition are more likely to be successful in subsequent entrepreneurial endeavors. It is the opposite for those in a self-serving condition. Despite they will be more likely to form higher re-enter intentions, they are less likely to learn from their negative experience and thus, might be more likely to fail again.

7.2 Future research

The conceptually derived framework presented in this article may serve as a point of departure for future empirical research on re-entering after entrepreneurial failure. An avenue for future research could be to address and develop operationalizations of constructs of our framework, and empirically test the propositions to confirm or reject the conceptual assumptions in this study. For researching re-enter intentions of failed entrepreneurs and its direct antecedents – the perceived feasibility and the perceived desirability, scholars can draw on the established stream of entrepreneurial intention literature (e.g. Liñán and Fayolle 2015; Schlaegel and Koenig 2014). Researchers should be cautious to prevent possible biases in retrospective studies, i.e. post failure. This might be particularly challenging in surveys with failed entrepreneurs (e.g. hindsight bias or recall bias) and with archival data (e.g. success bias). Thus, a field study or longitudinal research in which serial entrepreneurs are followed after a failure with their first venture would be of high value (Hsu et al. 2015). In assessing entrepreneurs' attributional style, the most widely used scale is the one from Peterson et al. (1982) and researchers could draw on

measures similar to this or one of the various situationally adopted scales (Peterson and Barrett 1987; Higgins and Hay 2003; Anderson et al. 1988; Furnham et al. 1992).

The aftermath or costs of failure represent the full failure magnitude, and this offers probably the largest potential for future research opportunities. Avenues for further studies exist in examining each of the costs and its determinants (see e.g. Ucbasaran et al. 2013). It must be stressed that the perceptual and chronological boundaries of each of these costs in the aftermath of failure may not be easily determined and measured, as they will remain contextually and situationally unique to each individual (perceived costs of failure). However, the content and processes of the aftermath of failure and the complex, interdependent relationships represent key areas for research as this has major implications for subsequent entrepreneurial activities (Cope 2011; Ucbasaran et al. 2013; Shepherd 2003). Future research on the costs of failure would therefore be of particular interest. In addition to the processes mentioned in this article, there are a number of further areas that should be examined in this context. In the following we name a few examples. First, we expected financial costs of failure to be negatively associated with re-enter intentions as they create a substantial barrier to subsequent business creation, simply due to resource scarcity. However, this resource scarcity due to high financial costs of failure may create a situation that facilitates bricolage, i.e. “making do by applying combinations of the resources at hand to new problems and opportunities” (Baker and Nelson 2005, p. 333). Resource scarcity can stimulate entrepreneurial activity and, if the scarce resources still available are used creatively, even turn high financial costs of failure into an advantage (Ucbasaran et al. 2013). Thus, venture failure creates an excellent ground for extending research on bricolage and how new opportunities are created out of resource scarcity after failure. Second, we know that venture failure can lead to high levels of social stigma which may harm private and professional relationships (Singh et al. 2015; Simmons et al. 2014) and that the

degree of social stigma after failure varies to large between different countries (Yamakawa and Cardon 2015; Ucbasaran et al. 2013). However, we do not know yet how politics, cultures and institutions can be changed towards more tolerance for business failure and thus, less social stigma. One dimension is for instance to further study the impact of a community's attributions of entrepreneurial failure. For instance, Cardon et al. (2011) have shown that regional differences in public attribution exists, i.e. whether the public blamed the entrepreneur for their mistakes, or placed blame upon outside factors deriving from the environments. Future research is here needed to examine the social dimensions in terms of impact of community's attribution on the individual entrepreneur and rehabilitation possibilities of entrepreneurs after failure.

Third, regarding psychological costs of failure, our article has considered the psychological costs of a failing with one's first venture on re-enter intentions and discussed implications of this. Here, further research should be conducted on how the perceived costs of failure can be influenced, since lower perceived costs of failure can lead to a higher probability of re-enter after failure. Also, it should be examined whether economic, social or psychological perceived costs of failure do have the most impact here and should therefore be highlighted within this research framework. Another so far understudied but interesting avenue for future research is to study the notion of multiple entrepreneurial failures and how the second or third failure is different from the first one (Shepherd and Patzelt 2017; Ucbasaran et al. 2013). It could be possible that entrepreneurs build up resilience through multiple failure experiences and are better prepared to deal with it. Alternatively, unresolved issues from the first failure could exacerbate matters with the second or third failure (Ucbasaran et al. 2013). Research on this topic would make a valuable contribution and provide further insight into the links between multiple failure experiences and insights in understanding the costs and benefits for entrepreneurs after failure.

Fourth, while we do not consider a time lag between the failure event and a re-enter to change the proposed relationships of our model, underlying reasons and determinants of a time lag should be further explored in future studies. It is necessary to examine the mechanism analyzed in this article and taking into account different time spans between failure and the formation of re-enter intentions (Shepherd and Patzelt 2017). This includes future research on the costs of failure and could explain how and why some entrepreneurs recover faster than others. It would be interesting for instance, whether an early or late re-enter into entrepreneurship would affect learning or success in the next round.

Furthermore, as a major contribution of this article lies in the influence of the attributional style of failed entrepreneurs, the question may arise if the attributional style can be altered through training or workshops. There are indications in the psychological literature that the attributional style can be altered through training over time (Dweck and Leggett 1988). This suggests that it might be possible to train failed entrepreneurs in a helplessness or victim-of-circumstances condition so that they attribute the failure experience to effort rather than ability (Cardon and McGrath 1999). However, as argued in the previous section, improper attributions can be problematic as they may prevent learning from failure. As McGrath (1999) points out, misattributions can lead to erroneous distinctions between luck and causality which makes ultimately further failure more likely (Cardon and McGrath 1999). Therefore, it is not necessarily useful to do a re-training of the attributional style if it inhibits learning from failure or promotes ill-conceived ideas - neither for the economy nor for the individual. There is also the question whether additional influencing factors, besides the attributional style, have affect learning from failure and thus, impact the performance of a subsequent new venture. Research suggests that an important prerequisite for organizational learning is the formation of new goals and forecasts (Baumard and Starbuck 2005; Cope 2011). This indicates that there may be other influencing

factors in addition to attributional style and therefore, additional parameters could be added by future research to the model.

Ultimately, the research model presented here is not context specific. However, a different context can have an influence on entrepreneurial behavior (Khan and Quaddus 2015; Stroeva et al. 2015). Thus, future research could nuance the model for more specific context and settings in which entrepreneurial failure can occur and thus, it should be examined if and to what extent different institutional, cultural, and economic settings influence the proposed relationships.

8 Conclusion

The objective of our study has been to explain re-entry into entrepreneurship after previously failing with a venture and therewith, sheds some light on the "black box" of the mechanisms why so many re-enter and become serial entrepreneurs (Stam et al. 2008; Baù et al. 2016). Understanding the mechanisms and its consequences have important implications for the success of serial entrepreneurship and thus, can impact economic growth and wealth creation. We contribute to the entrepreneurship, psychological and behavioral literature by examining the impact of failure on future entrepreneurship. Specifically, we complement prior empirical studies on serial entrepreneurship and entrepreneurial failure with a theoretical frame by bridging prior concepts of consequences of entrepreneurial failure in terms of its costs arising to the failed entrepreneur and extend the emerging stream of entrepreneurial intentions to a failure context. We specify psychological mechanism which are responsible for the impact of failure magnitude on the factors that directly impact the intention to re-enter. Furthermore, we suggest boundary conditions of cognitive processes that may impact the former relationship. Therewith, this study enhances our understanding of the entrepreneurial process from failing with one venture to the emergence of another one and we hope our research opens up a new stream of

discussion of failure in entrepreneurship and stimulates future research on implications of failure for serial entrepreneurship.

C Study 2: Exploratory and Exploitative Innovation in SMEs: The role of CEO's Temporal Focus

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Michiel Tempelaar, Roxana Turturea, and Ingrid Verheul developed the scales and gathered the data.

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1 Introduction

People vary in their perceptions of time periods, i.e. the past, the present, and the future and devote different amounts of cognitive resources to those time periods (Bluedorn 2002; Zimbardo and Boyd 1999; Shipp et al. 2009). Temporal focus is a psychological attribute that refers to the attention that we pay to thinking about different time periods (Shipp et al. 2009; Chishima et al. 2017). For example, individuals who have a present orientation focus on solving current problems, dealing with urgent tasks and living in the 'here and now', whereas those who have a future orientation spend most of their time on planning future activities, thinking about the long-term consequences of their behavior, and – in the case of entrepreneurs – attempting to predict reactions of competitors and customers. The amount of time and attention individuals spend on the past, present and future has important consequences for how they process information and make decisions (George and Jones 2000; Zimbardo and Boyd 1999; Shipp et al. 2009). According to Das (1987) a present focus leads decision-makers to make plans with shorter time horizons, whilst at the same time it is linked with risk taking and impulsive behavior and the disregard of long-term consequences (Zimbardo and Boyd 1999). A future perspective is associated with a longer time horizon in planning (Das 1987). It can foster goal setting, achievement motivation, and willingness to delay immediate gratifications. (Zimbardo and Boyd 1999).

The perception of time and its influence on strategic decision-making is an emerging stream of research (Yadav et al. 2007; Nadkarni and Chen 2014). Different views of time may act as distinct temporal filters that shape judgements and influence how executives view the world, in turn affecting their strategic decisions and business outcomes (Shi et al. 2012; Chen and Nadkarni 2017). For example, the temporal focus of managers has been linked with decision

outcomes such as strategic change (West and Meyer 1997), innovation (Nadkarni et al. 2016; Nadkarni and Chen 2014), and performance (Mohammed and Harrison 2013).

In this study, we investigate how the temporal focus of CEOs in small and medium enterprises (SMEs) influences exploitative and exploratory innovation activities. Exploitative innovations involve refinement and efficiency of existing technologies, products, and services (Levinthal and March 1993; Jansen et al. 2006; Benner and Tushman 2003). Explorative innovations are based on discovery and experimentation which requires new knowledge and deviation from the already known (Levinthal and March 1993; March 1991). The notion of exploitation and exploration (March 1991; Levinthal and March 1993) has been shown to be of importance in theories of technological innovation, organizational adaption, and organizational learning (Benner and Tushman 2003; Jansen et al. 2006; Jansen et al. 2009). As SMEs typically have fewer slack resources, less mature organizational routines and less operational experience in different business areas than large enterprises, additional conceptional and empirical research what leads to the different forms of innovation is required (Li et al. 2014; Brigham et al. 2014).

CEOs characteristics have a strong influence on the general direction of a company (Hambrick and Mason 1984) and on innovation in particular (Gerstner et al. 2013; Yadav et al. 2007). Previous research found that CEOs as key decision-makers in firms have an important role in driving exploitative and exploratory innovation (Gibson and Birkinshaw 2004; O'Reilly and Tushman 2011; Ahmadi et al. 2017). Given the common low hierarchy levels and the authority structures, the influence of CEOs in SMEs is even stronger compared to larger firms (Bierly and Daly 2007; Man et al. 2002; Kammerlander et al. 2015, p. 583). However, most of prior research has primarily considered organizational determinants that influence exploitative and explorative innovation (Chang et al. 2011; Eriksson 2013; Sidhu et al. 2004) and there is a paucity of research on psychological attributes that may influence CEOs orientation towards exploitation and exploration (Gupta et al. 2006). We aim to address this research gap by

examining what mechanism make CEOs more inclined towards exploitation or exploration (Sitkin et al. 2011; Ahmadi et al. 2017). Specifically, we look at the attention executives devote to present and future challenges in their company. We argue that a CEO present focus leads to more exploitative innovation while a CEO future leads to more explorative innovation. Furthermore, we propose that these relationships are contingent upon environmental conditions.

Our study contributes to the literature in several ways. First, we build on and extend the work of Yadav et al. (2007), focusing on the link between CEO attention and incremental innovation, and that by Nadkarni and Chen (2014), linking CEO temporal focus to new product introductions. With some exceptions (e.g. Nadkarni and Chen 2014; Yadav et al. 2007), prior research in strategic management primarily considered often short- and long-term orientation on a firm level (Marginson and McAulay 2008; Flammer and Bansal 2017) without giving attention to the psychological mechanisms of time perspectives. By drawing on temporal focus theory (Shipp et al. 2009; Zimbardo and Boyd 1999), we develop a psychological perspective on executive's strategic decisions. Hence, we contribute to the emerging literature of the role of subjective time perception in strategic decision-making. Second, prior research on exploration-exploitation largely focused on a firm-level perspective and studies at the individual or team level that study the cognitive antecedents of exploitation and exploration based on managers' characteristics are scarce (Ahmadi et al. 2017; Laureiro-Martínez et al. 2015; Lavie et al. 2010). We examine the influence of temporal considerations in exploitation and exploration and how this can be evoked by executives' temporal focus. Our study thereby contributes to the research on the link between executives' characteristics and firm-level outcomes (Hambrick 2007; Hambrick et al. 2005; Finkelstein et al. 1996). Third, a growing body of research has regarded environmental dynamism as key factor in understanding how executives act, behave and respond in different decision-making contexts (Akgün et al. 2008; Ensley et al. 2006; Schilke 2014). We provide explanations that enable a better understanding of the psychological foundations of

executive's exploitation and exploration activities in response to changing environmental conditions. By drawing on the executive's demand literature (Hambrick et al. 2005; Hambrick 2007), our study explains how the influence of a CEO's temporal focus on exploratory and exploitative innovation is contingent upon dynamic environmental conditions. We test our theoretical framework using a survey approach with a matched sample of 150 CEOs and members of the top management team (TMT) in SMEs in the Netherlands.

The study is structured as follows. We first present the theoretical background of the constructs used in this study. After developing hypotheses, we provide details about data collection, sample and the measurement instruments in the method section. In the following, we present empirical findings and conclude with a discussion of our results, implications and avenues for future research.

2 Theoretical Foundations and Development of Hypotheses

2.1 The concept of temporal focus

Findings from psychological research on temporal focus dates back to Lewin (1942) and research interest has grown rapidly in recent years. An individual's time perspective is a broad term for a multifaced and overarching concept towards various views related to time (Shipp et al. 2009; Zimbardo and Boyd 1999; Holman and Silver 1998). Psychological time perspective is considered as a relatively stable difference between individuals which is developed in early years through many learned factors, such as national culture, parental beliefs about time, education, occupation, and personal experiences (Shipp et al. 2009; Zimbardo and Boyd 1999). Temporal focus can be viewed as one component of time perspective and relates to the extent executives characteristically devote their attention to the past, present, and future (Shipp et al.

2009; Bluedorn 2002). While early studies on time perception treated time perspective as a continuum where individuals are pronounced towards either past, present or future (de Volder and Lens 1982; Nuttin 1985), more recent research emphasized that different time perspectives are distinct dimensions, which are best represented by separate dimensions of different times instead of points on a continuum. People can be high on more than one dimension and a person who is high on both, present and future focus might be equally interested in today's occurrences and planning for tomorrow (Zimbardo and Boyd 1999; Shipp et al. 2009). As Shipp et al. (2009, p. 2) point out "people can shift their attention among different time periods and that focusing on one period does not necessarily prevent thinking about the other two." Hence, temporal focus represents the general tendency to focus on particular time periods to varying degrees (Zimbardo and Boyd 1999; Shipp et al. 2009). This conceptualization does not impose any a priori boundaries of specific events where executives might focus on and is content neutral (Nadkarni and Chen 2014). This general conceptualization of a present and future focus avoids tautological problems such as *thinking about innovation leads to more innovation* (Chandy and Tellis 1998; Yadav et al. 2007).

A strong present focus is associated with a "here and now" framing in decision-making with may lead to emphasizing current opportunities and a more spontaneous behavior (Shipp et al. 2009; Nadkarni and Chen 2014). In contrast, a high future focus refers to an emphasis on events that are yet to occur (Chandy and Tellis 1998) and thus, actions taken by executives, anticipated outcomes, other general developments in strategic decision contexts (Yadav et al. 2007).

2.2 Temporal Focus and the Pursuit of Exploitative and Explorative Innovation

Following an established stream of the management literature, we classify innovation along the two distinctions: (1) exploitative innovations, classified as incremental innovations that involve refinement and efficiency (Levinthal and March 1993; Jansen et al. 2006; Benner and Tushman 2003). These innovations usually built upon already existing technologies, products, and services and are designed to meet needs of current markets or customers. This could be for example by increasing the efficiency of existing processes, expand a product line with minor features, improve an established design, or broaden existing knowledge and skills (Jansen et al. 2006; Abernathy and Clark 1985). (2) explorative innovations, classified as radical innovations that involve discovery and experimentation. Those innovations require new knowledge and deviation from the already known (Levinthal and March 1993; March 1991). These innovations are designed to meet needs of, for instance, new markets or emerging customer demands and offer new technologies, create new markets, and develop new distribution channels (Benner and Tushman 2003; Jansen et al. 2006; Levinthal and March 1993).

A key role in determining whether a firm sets an exploitative or explorative innovation strategy is played by its top management (Gibson and Birkinshaw 2004; O'Reilly and Tushman 2011; Ahmadi et al. 2017). This is particularly the case with SMEs, given the low hierarchy levels and authority structures that are common there, which increases the influence of CEOs even more in SMEs compared to larger firms (Bierly and Daly 2007; Man et al. 2002). CEOs as the central decision-makers of a firm are most capable in setting the general strategy of a firm and therewith, steering the attention focus of its members. Hence, CEOs temporal attention focus has direct and long-term impact on the type and magnitude of innovation (Yadav et al. 2007). For example, Yadav et al. (2007) found that a CEO future focus is positively associated with

innovation. Nadkarni and Chen (2014) found that both, a CEO present and future focus can positively influence the number of new products a firm launches. As Nadkarni and Chen (2014) point out, a present focus can enable quick recognition of new opportunities by providing better understanding of a current market or technology situation and facilitates the implementation of real-time information into innovation ideas (Eisenhardt and Tabrizi 1995). A future focus leads executives' attention to prospective technologies and market needs and thus, is associated with higher anticipation and advance preparedness for opportunities yet to occur (Yadav et al. 2007). However, planning and developing for further in the future is difficult, fraught with risk and costly (Helfat 1998; Smith et al. 2005; Nerkar and Roberts 2004). While both, a present and future focus might positively affect innovation activities, the types of innovation, exploitative and explorative, do not seem to be the same and need to be distinguished. We are nuancing prior findings of temporal attentions on innovation activity (Nadkarni and Chen 2014) by differentiating between exploitative and explorative innovation. For example, exploitative activities help companies to learn and adapt rapidly in the short term but also investment rewards of exploitative innovation are relatively certain and can be reaped close in time (Benner and Tushman 2002; Jansen et al. 2006; Levinthal and March 1993; March 1991). On the contrary, explorative innovations are much more uncertain and possible rewards lie distant in the future (March 1991; Levinthal and March 1993).

Despite the highly influential role of executives in driving a firm's innovation, research on the psychological mechanisms influencing exploitation and exploration is lacking (Laureiro-Martínez et al. 2015; Soo et al. 2013; Ahmadi et al. 2017). We focus on the relation between executives' temporal focus and the extent of exploitative and explorative innovation. Recent studies mentioned the significance of time "as a reference point for the strategic decision maker" (Marginson and McAulay 2008, p. 273) and has identified temporal perspective as highly relevant for strategic decision-making in organizations (Nadkarni and Chen 2014; Nadkarni et al. 2016;

Yadav et al. 2007). Thus, integrating temporal perceptions of executives into strategic decision-making is a nascent field of research in management.

2.3 CEO's Present Focus, Exploitation and Exploration

While an emphasis on the needs of today might be essential to maintain a current level of excellence of the firm, it less likely to be the basis for innovation (Yadav et al. 2007; Chandy and Tellis 1998). Although executives with a present focus will recognize the need for investing in innovation to keep the firm competitive and successful, we expect that they are more likely to restrict their efforts to types of innovation that lead to a foreseeable pay-off of endeavors and hence, exploitative innovation. Exploitation refers to manager's tendency for optimizing and refining existing winning formulas. A present focus is associated with concentrating on energetic engagement, impulsiveness and immediate gratification (Zimbardo and Boyd 1999). This relates to the expected pay-off profile of exploitative innovation which may be achieved in a smaller time horizon, from six months to two years (Leifer 2000). Thus, a potential pay-off can be achieved early on and successes can be seen in the short-term already (Zellweger 2007). Some scholars argue that CEOs are frequently giving more importance to the handling of actual day-to-day matters than to those of yesterday or tomorrow (Finkelstein 2005; Khurana 2002; Tripsas and Gavetti 2000). This might be of advantage for maintaining the level excellence a firm may have achieved (Yadav et al. 2007) but in terms of innovation we expect that a CEO with a present focus concentrate on actions where a quick pay-off is possible and thus, exploitation.

In contrast, explorative innovation is a tendency for probing and developing new technologies and generate new markets (Abernathy and Clark 1985; Benner and Tushman 2003; Levinthal and March 1993). It bears more chances but also more risks and is rather long-term. Particularly, explorative and industry-creating or -changing innovations only pay-off after an appreciable

delay of sometimes greater than ten years (Leifer 2000). We expect that a temporal present focus will be negatively associated with exploration where a possible pay-off is linked to high efforts today but results not foreseeable any time soon (Levinthal and March, 1993). A focus on the present can discourage experimentation as outcomes are usually expected in the long-term future and therefore, a present focus might inhibit explorative innovation efforts (Zellweger 2007; Lumpkin et al. 2010). Thus, our resulting hypotheses are:

H1: *A* CEO *present focus will be positively associated with exploitative innovation*

H2: *A* CEO *present focus will be negatively associated with exploratory innovation*

2.4 CEO's Future Focus, Exploitation and Exploration

Prior research hints a high future focus will be associated with innovation in general (Yadav et al. 2007; Chandy and Tellis 1998; Flammer and Bansal 2017). A high future focus of executives leads to more awareness and greater anticipation for future events and markets. Further, it decreases the probability of attending exclusively concerns of current issues and rather looking onto the long-term impact of today's decisions and actions (Shipp et al. 2009). When the CEOs have a future focus, they will be more willing to delay immediate gratification in term of expecting instant payoffs and instead striving for strategies which are more promising for long-term success (Zimbardo and Boyd 1999). As exploitative innovations aim at the adjustment of minor features and efficiency, their objectives are usually rather short-term nature (Jansen et al. 2006; Abernathy and Clark 1985). Hence, we expect a negative relationship between a future focused CEO and exploitation. Formally, we derive:

H3: *A CEO future focus will be negatively associated with exploitative innovation*

A focus on the future guides executives' attention to future technologies and market needs and thus, is associated with higher anticipation and advance preparedness for opportunities yet to occur. This in turn enables quicker development of explorative innovation activities (Yadav et al. 2007). Managers with a future market focus are also better informed about new and emerging technologies, making them less concerned with past investments in current technology and less inert and thus, a future focus causes managers are concerned with more radical innovations rather than incremental (Chandy and Tellis 1998). Moreover, a future focus echoes Gavetti and Levinthal's (2000) forward-looking cognition, which is related to more distant search. This leads to discrete solutions to existing problems which in turn relates to exploratory innovation, as this implies a higher likelihood of embracing radical solutions. So, not only are CEOs with future focus more oriented on future viability, they are also more inclined to pursue new-to-the-firm solutions to existing problems. Therefore, we derive:

H4: *A CEO future focus will be positively associated with exploratory innovation*

2.5 The Moderating Role of Environmental Dynamism

Research in the field of strategic management and innovation has long acknowledged the important role of the external environment (Garg et al. 2003; Khan and Manopichetwattana 1989; Levinthal and March 1993; Jansen et al. 2009) and its interaction with executives' traits and characteristics in strategic decision-making (Finkelstein et al. 1996; Hambrick 2007). Executive job demands literature has been used in several studies to show that there is variation in the fit of executives' abilities and characteristics and demands of the environmental context they are confronted with (Finkelstein et al. 1996; Hambrick 2007; Hambrick et al. 2005; Nadkarni and Chen 2014). CEOs who are faced with high job demands are more likely to take mental shortcuts and fall back on what they have focused on in the past (Hambrick 2007). Therefore,

we assume that challenging environments increase the influence of existing characteristics or traits such as temporal focus on decisions or actions. Conversely, CEOs in lower job demands environments can afford to be more comprehensive and detailed in their analyses and less influence is exerted by their characteristics or traits and their decisions (Hambrick 2007, p. 336).

Regarding the pursuit of explorative and exploitative innovation, prior research argued that dynamism as environmental state may act as a boundary condition (Jansen et al. 2006; Jansen et al. 2009). Environmental dynamism refers to the degree of instability and unpredictability of the external environment (Dess and Beard 1984; Jansen et al. 2006). This definition includes both volatility, meaning the rate and amount of change, and uncertainty as key characteristics (Miller and Friesen 1983). Stable and dynamic environments differ for example in terms of the rapidness technological change or industry structure, variation of customer preferences, and fluctuation in product demand or material supply (Jansen et al. 2009; Jansen et al. 2006). Consequently, stable environments are characterized by a small and infrequent rate of change, predictability and when changes occur, they can be usually anticipated by market participants. In highly dynamic environments on the other hand, where changes occur on regular basis and rapidly, changes are less foreseeable or predictable (Schilke 2014).

Prior research on time perceptions indicates that specific time perspectives operate differently in specific environmental conditions. As perceptions of the present and the future can be understood as filters on how executives perceive, evaluate and allocate attention to events, their consequences may be contingent on different environmental states and how executives address demands in differing contexts (Huy 2001; Nadkarni et al. 2016; Nadkarni and Chen 2014). Through constant and unpredictable alteration of states, dynamic environments are assumed to be more challenging for CEOs to handle than stable environments. Thus, we expect in line with the executive job demands literature that the degree of environmental dynamism will moderate the relationship of CEO's temporal focus and the distinct forms of innovation. More

specifically, we expect that in dynamic environment the influence of temporal focus on innovation forms will be more strongly pronounced than in stable environments.

Accordingly, we propose that environmental dynamism amplifies the positive relationship of a CEO present focus and exploitative innovation. Timely recognition of market opportunities and possibilities for improvements require a strong focus on the here-and-now based on real-time information (Eisenhardt and Martin 2000; Nadkarni and Chen 2014). With an emphasis on the here-and-now and the use real time information to find solutions (Zimbardo and Boyd 1999), executives can use instant feedback from dynamic environments to improve processes, to validate their exploitative innovations rapidly and fine tune developments based on that feedback (Nadkarni and Chen 2014). Therefore, we derive:

H5: *Environmental dynamism positively moderates the relationship between CEO present focus and exploitative innovation such that the positive relationship between present focus and exploitation is stronger in dynamic than in stable markets.*

We expect that environmental dynamism amplifies the negative relationship of a CEO present focus and explorative innovation. The fast and unpredictable changes in dynamic markets create a strong urge for CEOs for quick successes instead of investing in experimentation and development – i.e. exploration activities – which only materialize in the long-term future. Hence, we propose that in dynamic environments CEO's are even more reluctant to pursue explorative innovation activities and formulate:

H6: *Environmental dynamism positively moderates the relationship between CEO present focus and explorative innovation such that the negative relationship between present focus and exploration is weaker in dynamic than in stable markets.*

Furthermore, we propose that environmental dynamism amplifies the negative relationship of a CEO future focus and exploitative innovation. Following Gavetti and Levinthal (2000), dynamic conditions imply discontinuities in the market where technological change is unpredictable or customer demand changes erratically. This reaffirms future focused CEOs' negative inclination towards continual, incremental solutions to existing problems, thus enforcing the negative relationship between future focus and exploitation.

H7: *Environmental dynamism positively moderates the relationship between CEO future focus and exploitative innovation insofar that the negative relationship between future focus and exploitative innovation is stronger in dynamic than in stable markets.*

In dynamic environments, the tendency of future focused executives to image and plan for the future is particularly suitable. Here, a tried-and-true approach is not applicable as markets are frequently changing. Technological and market information are shifting rapidly and thus, potential for feedback learning is low and opportunities are transient (Atuahene-Gima and Li 2004; Nadkarni and Chen 2014). Thus, we expect that the relationship of a CEO future focus and explorative innovation will be stronger in dynamic environments. Current products and services become quickly obsolete and require experimentation (Gavetti and Levinthal 2000; Sørensen and Stuart 2000). Here, a future focused CEO will require explorative innovations that diverge from existing products, services and markets. When markets are changing fast and unpredictably, it is necessary for future success that new markets are created, new technologies are offered, and new distribution channels are developed (Jansen et al. 2006). Hence, we derive

H8: *Environmental dynamism positively moderates the relationship between CEO future focus and explorative innovation insofar that the positive relationship between future focus and explorative innovation is stronger in dynamic than in stable markets.*

The hypotheses and proposed relationships are depicted in our theoretical framework (Figure C-1).

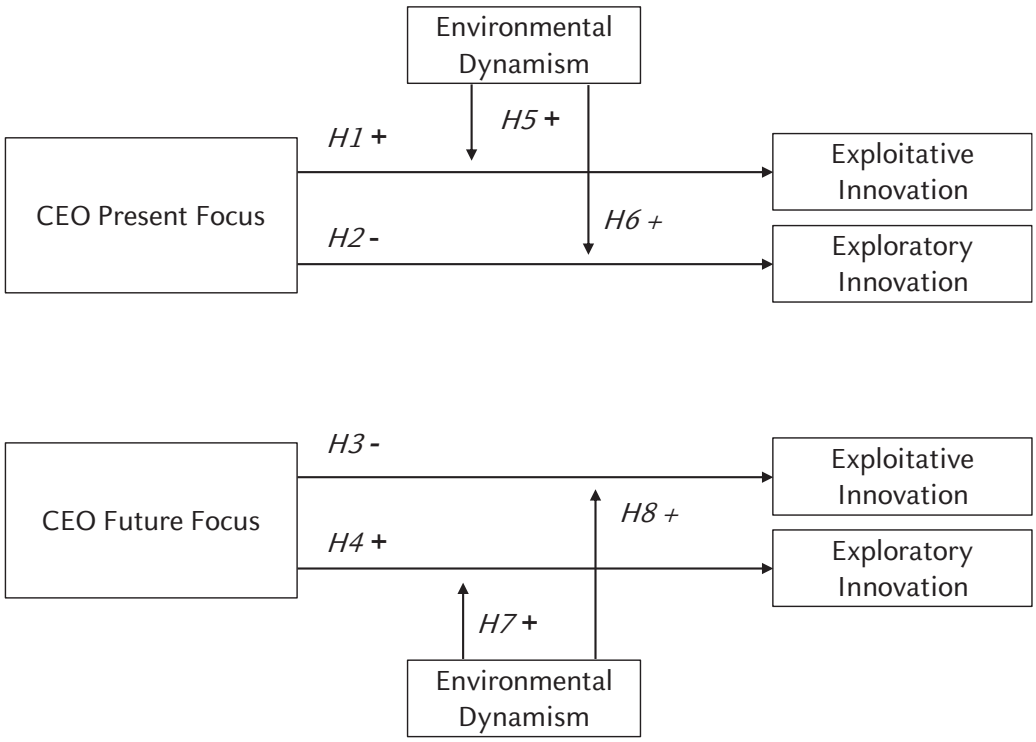

Figure C-1: Research model

3 Methodology

3.1 Data collection

For the data collection, we used a commercial database and randomly identified 3,000 small and midsized enterprises within the Netherlands. The empirical study took place in 2014 and we restricted our search to private organizations with a minimum of five and a maximum of 250 employees, covering a broad variety of industries.

We sent out two surveys to each organization, one addressed to the CEO, and one to another team member of the management asking the CEO to give the second survey for completion to

another member of the top management team. The data collection resulted in a total response from 358 distinct companies and a total number of 509 questionnaires (either filled in by the CEO or the other management team member), resulting in a response rate of 11.9%. The number of firms for which we have a matched sample for, means responses from the CEO and another TMT member includes 151 companies. We removed one case as there were missing values on almost all items of the temporal focus construct. There was one missing value in item 1 of our construct environmental dynamism, for which we inserted the median. Thus, we had a final sample size of 150 companies.

The companies in our sample are distributed across the following industries: administrative and support (7.33%), financial services (3.33%), information and communications technology (14.00%), manufacturing (27.33), professional services (35.33%), transportation (10.67%), and others, which do not fall into either of the following (2.00%). The mean company age in our final sample is 30.19 years and the average number of employees is 39. An overview over the sample characteristics is provided in Table C-1.

Table C-1: Sample characteristics

Sample Characteristics	Frequency	Percentage
Employees		
< 10	21	14,00%
10-50	97	64,67%
51-100	17	11,33%
> 100	15	10,00%
Mean	39,38	
Standard Deviation	42,78	
Median	23,00	
N	150	
Company Age		
Mean	30,19	
Standard Deviation	25,80	
Median	23,50	
N	150	

(continued on next page)

Industry Distribution			
Administrative and support	11		7,33%
Financial services	5		3,33%
ICT	21		14,00%
Manufacturing	41		27,33%
Other	3		2,00%
Professional services	53		35,33%
Transportation	16		10,67%
N		150	

3.2 Measurements

We used existing scales and verified them through a variety of analyses as described in the following section. All items were measured on a seven-point psychometric scale, anchored by 1=strongly disagree and 7=strongly agree. The main variables in our research model constitute latent constructs consisting of three to six items. We calculated our variables using the mean rating of the items comprising of a scale as this approach for scale aggregation "is strongly recommended, and this method is almost always used in published research" (Robinson 2018, p. 748).

Temporal Focus. Our measures for present and future temporal focus were inspired by Soo et al. (2013) who developed and validated a four-item scale for senior managers and executive based on work about temporal focus of Shipp et al. (2009) and Marginson and McAulay (2008). In line with our theoretical reasoning, we took the temporal focus measure of the CEO. We conducted an exploratory factor analysis to test the validity of our adapted scales of temporal focus. We decided to take one item out of present focus due to low communality value (0.31) and a high cross loading with future focus (it loaded with 0.39 on the present focus factor and with 0.36 on the future focus factor). The final pattern matrix of exploratory factor analysis can be found in Table C-2. Our two factors, consisting of three and four items together explain 56.65% of the variance. To exemplify our scale, an example for present focus is "*We give*

priority to dealing with issues currently facing the organization". We measured future focus with e.g. "*We place importance on trying to imagine what opportunities tomorrow will bring".* As the items were formulated with "we" instead of "I", we assessed the interrater reliability between the ratings of the CEO and the TMT member. Interrater reliability is calculated using intra-class correlation as the appropriate measure for ordinal, interval, and ratio variables (Hallgren 2012). The intra-class correlation for present focus is 0.291 and for future focus 0,344. This indicates poor levels of agreement as the cutoff criteria for an acceptable intra-class correlation is >0.40 (Cicchetti 1994; Hallgren 2012). The poor level of agreement suggests that the wording of the plural had no major influence on the trait of temporal focus and that the temporal focus measures was captured on an individual level instead of a team level.

Table C-2: Results of exploratory factor analysis of temporal focus

Item	Factor 1	Factor 2
Factor 1: Present Focus		
Our MT focuses attention mainly on immediate issues the organization has to deal with	**,65**	,03
We concentrate on improving short-term budget performance	**,66**	,10
We give priority to dealing with issues currently facing the organization	**,72**	-,10
Factor 2: Future Focus		
Our MT devotes a lot of its attention to thinking about the organization's future	-,08	**,82**
We find it important to try imagine what opportunities tomorrow will bring	-,04	**,81**
We often work on improving long-run financial effectiveness	,09	**,70**
We encourage ideas and actions that address the organization's long-term future	,06	**,81**
Percentage of variance explained	18,67	36,87
Excluded items:		
We spend a lot of time thinking about where the organization is at present		

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.
Rotation converged in 3 iterations.

Exploitation and Exploration. Measures for the dependent variables *exploitative innovation* and *exploratory innovation* where adopted by Jansen et al. (2006). Both variables were measured with 6-items scales. One example item for exploitation is "*We regularly implement small adaptations to existing products and services*" and an example for exploration is "*We*

commercialize products and services that are completely new to our organization". For exploration and exploitation, we used measures out of the matched sample from the TMT.

Environmental Dynamism. The moderating variable *environmental dynamism* taps on the rate of the instability and change of the external environment. The variable was captured with a scale validated by Jansen et al. (2009) with a five-item measure from the TMT.

Control variables. We controlled for possible alternative explanations by including relevant control variables identified by previous research. The control variables were assessed in the same manner as the study variables in psychometric scales. Executives demographics and characteristics can play a major in innovation (Hambrick and Mason 1984; Barker and Mueller 2002). To account for any effects that might be results of executive's experience, we included executive's *age* and *tenure* (e.g. Mom et al. 2009). Previous literature argued that "One of the most enduring findings about executive age is that older executives tend to be more conservative" (Barker and Mueller 2002, p. 785; Hambrick and Mason 1984). We applied *tenure* of the CEO and the TMT as a control variable as executives with longer tenures have been found to be less supportive for innovation activities than executives with shorter tenures (Barker and Mueller 2002). Executive's *education* was assessed in terms of what their highest level of education was. Additionally, firm level variables have been shown to influence exploitation and exploration activities (e.g. Jansen et al. 2006; Uotila et al. 2009). Smaller and younger companies are usually more dynamic and can proceed innovation processes more rapidly than larger firm, hence controlled for *firm size*, measured in as the total number of employees (Kammerlander et al. 2015). *Firm age* was measured in number of years since its foundation. We employed *slack resources* as control variable as slack in monetary and human resources has been shown to influence exploration and exploration activities (Eriksson 2013; Sidhu et al. 2004). We measured slack resources with a 5-item scale, asking about resource liquidity and general availability of financial and human resources. Expenditure for research and development (*R&D*

expenditure) was measured by asking executives how much their company invested on average in R&D over the last three years. Furthermore, TMT size was employed as a control variable. Lastly, we controlled for possible industry effects by including industry dummies (baseline is transportation industry).

Confirmatory factor analysis. To assess the reliability and validity of the multi-item measurement scale we performed a confirmatory factor analysis. According to our conceptual model, we estimated two four-factor-measurement models using IBM AMOS 23. The analysis includes the study's major constructs, i.e. dependent variables, independent variables and the moderator variable. We assessed both of our models – one with exploitation as the dependent variable and one with exploration, respectively – in terms of their model fit, internal consistency reliability, convergent validity, and discriminant validity (Hair et al. 2010). Confirmatory factor analysis revealed that both models fit the data well. We used recommended combinations of fit measures (Hu and Bentler 1999) and calculated the measures with the "Model Fit Measure" Tool developed by Gaskin and Lim (2016b). Results in Table C-3 show that for both models the ratio of $\chi 2/df$ is in the acceptable range of 1.0 and 3.0, comparative fit index (compares the fit of a target model to the fit of an independent, or null, model) is above the threshold of 0.9, standardized root mean square residual (a parsimony-adjusted index) below 0.1, root mean square error of approximation (square-root of the difference between the residuals of the sample covariance matrix and the hypothesized model) below 0.08 and *p* of fit close (sampling error in root mean square error of approximation) above 0.01 (Hu and Bentler 1999).

To calculate the validity and reliability values we used the "Master Validity Tool" for AMOS 23 developed by Gaskin and Lim (2016a). Table C-4 gives an overview of the model validity and reliability measures. To assess the internal consistency reliability, we report the composite reliability and Cronbach's alpha for each construct. Composite reliability is considered superior to other reliability measure (Hair et al. 2010), however, we report Cronbach's alpha additionally

to enable comparison with other studies. All our constructs reached values above the suggested thresholds for composite reliability of 0.7 and for Cronbach's alpha 0.7 (Bagozzi and Yi 1998; Hair et al. 2010).

Table C-3: Model fit measures

Model	$\chi 2$ (df) p	$\chi 2$/df	Comparative fit index	Standardized root mean square residual	Root mean square error of approximation	*p* of close fit
Exploitation model	209.217 (128) 0.000	1.635	0.917	0.074	0.065	0.062
Exploration model	219.685 (128) 0.000	1.716	0.923	0.068	0.069	0.024

Convergent validity, i.e. that variables correlate well with each other within their parent factor, is evaluated by analyzing the average variance extracted between a construct and its respective indicators (Fornell and Larcker 1981) and composite reliability. As a rule of thumb, values of the average variance extracted above 0.5 indicate support of convergent validity and that there are no significant measurement errors (Bagozzi and Yi 1998; Hair et al. 2010). The statistics displayed in Table C-4 show that is the case for all constructs except exploitation (average variance extracted = 0.341).

We decided to keep the exploitation construct with all six items[1] however, as this construct is conceptually established and validated by Jansen et al. (2006) and Malhotra and Dash (2011) argue that the rule of thumb for average variance extracted is often too strict, and reliability can be established through composite reliability alone.

Discriminant validity is analyzed on the item-level in the exploratory factor analysis and the in the confirmatory factor analysis by the Fornell/Larcker-Criterion (Fornell and Larcker 1981). For the former, we conducted an exploratory factor analysis with principal axis factoring and

[1] Convergent validity of exploitation does not change significantly when deleting items with lower loadings.

promax rotation Kaiser normalization for both models with results presented in Table C-5. The analysis clearly replicated the intended four-factor structure for both models with each item loading clearly on their intended factor. All items are represented by unique factors with loadings greater than 0.40, except one item of exploitation. We decided to keep that item however, as we consider it as conceptually important and we use a validated scale for this construct (Jansen et al. 2006). The Fornell/Larcker-Criterion suggests that the square root of a construct's average variance extracted should be greater than inter-construct correlations (Hair et al. 2010). All constructs fulfill this criterion and hence, we assume the existence of discriminant validity for all of our constructs.

Table C-4: Model validity and reliability measures

Dimension	# of items	Cronbach's alpha	Composite reliability	Average variance extr.
Present Focus	3	0.784	0.789	0.556
Future Focus	4	0.859	0.864	0.614
Environmental Dynamism	5	0.830	0.832	0.503
Exploitation	6	0.747	0.747	0.341
Exploration	6	0.858	0.854	0.502

Table C-5: Results of exploratory factor analysis

Item	Factor loadings	
	Exploitation model	Exploration model
Factor 1: Present focus		
Our MT focuses attention mainly on immediate issues the organization has to deal with	0,74	0,79
We concentrate on improving short-term budget performance	0,80	0,77
We give priority to dealing with issues currently facing the organization	0,69	0,67
Factor 2: Future focus		
Our MT devotes a lot of its attention to thinking about the organization's future	0,82	0,84
We find it important to try imagine what opportunities tomorrow will bring	0,74	0,74
We often work on improving long-run financial effectiveness	0,79	0,79
We encourage ideas and actions that address the organization's long-term future	0,80	0,79
Factor 3: Environmental dynamism		
Environmental changes in our local market are highly unpredictable	0,64	0,66
Environmental changes in our local market are intense	0,70	0,66
Our clients regularly ask for new products and services	0,70	0,59
In our local market, changes are taking place continuously	0,81	0,79
Demand for products and services changes frequently and rapidly in our local market	0,70	0,74
Factor 4: Exploitation		
We regularly implement small adaptations to existing products and services	0,59	
We introduce improved, but existing products and services for our local market	0,74	
We improve our provision's efficiency of products and services	0,69	
We increase economies of scales in existing markets	0,68	
Our organization expands services for existing clients	0,47	
Lowering costs of internal processes is an important objectives	0,36	
Factor 4: Exploration		
Our organization accepts demands that go beyond existing products and services		0,66
We invent new products and services		0,84
We experiment with new products and services in our local market		0,83
We commercialize products and services that are completely new to our organization		0,67
We frequently utilize new opportunities in new markets		0,70
Our organization regularly uses new distribution channels		0,52
Percentage of variance explained	51,17	56,14

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.
Rotation converged in 5 iterations.

Multicollinearity. We tested for multicollinearity in the models by examining the variance inflation factors for all of the main study variables. Inspection of the variance inflation factors in all models revealed the highest variance inflation factor to be 3.5, well below the maximum

threshold of 10, suggesting that multicollinearity was not a major problem in the regression analysis (Neter et al. 1996).

Non-response bias. To address the possibility of a non-response bias, we conducted an independent-sample t-tests of early and late responses, i.e. the first and the fourth percentile of response dates (Whitehead et al. 1993). There were no significant differences in the independent study variables between early and late respondents.

Common method bias. To test for a common method bias, we undertook several steps. First, we collected data on the main independent variables (temporal focus) from the CEO and the dependent variables from the TMT and thus, separately from each other. In addition to the surveys, we accompanied a letter in which we asked the CEO to give the second survey for completion to another member of the top management team. Second, participants filled in a comprehensive survey in which the questions related to our variables were embedded. The questions in this survey were ordered in a way that made it almost impossible for survey respondents to draw any conclusions about research propositions and to adapt answering behavior accordingly (Podsakoff et al. 2003). Third, an ex-post assessment of common method variance, we conducted Harman's One-Factor approach by loading all main study items into an exploratory factor analysis. Results revealed that no single factor explained more than 25% of the total variance, suggesting that common method bias was unlikely to be a serious problem in our study (Podsakoff et al. 2003).

4 Analysis and Results

4.1 Descriptive statistics and correlations

Table C-6 shows means and standard deviations of the study variables and correlations among the different constructs. Consistent with previous studies, also SME firms in our sample tend to prefer exploitation over exploration (March 1991; Jansen et al. 2009), with a significantly higher mean value for exploitation than exploration (4,96 vs 4,39, $p < 0.01$).

Table C-6: Descriptives and correlations

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Controls																						
1	Age (CEO)	51.32	9.21																			
2	Age (TMT)	44.37	9.71	,19*																		
3	Education (CEO)	2.28	.79	-,18*	-.03																	
4	Education (TMT)	2.20	.80	-.06	-.12	,42**																
5	Tenure (CEO)	17.03	11.17	,56**	.06	-,27**	-.10															
6	Tenure (TMT)	11.46	8.90	.10	,53*	-,24**	-,19*	,34**														
7	Firm Age	30.26	25.73	,22**	.05	.01	.01	,26**	,23**													
8	Firm Size	39.16	42.72	.00	-.02	.10	.09	-.06	.04	.06												
9	TMT Size	4.22	1.71	.05	-.06	.13	.15	.08	.00	.13	,39**											
10	Slack Resources	4.05	.94	.05	.12	.05	.00	.08	.14	-.01	.07	-.03										
11	R&D Expenditure	6.15	6.63	-.08	.01	.04	.07	.06	.02	-.16	-.13	-.03	.08									
12	Manufactoring	.27	.45	.05	-.03	.08	.05	.02	.00	,27**	,27**	,33**	.06	-.04								
13	Professional and technical services	.36	.48	.09	-.05	.01	.07	-.03	-,17*	-,25**	-,21*	-,17*	-.07	-.11	-,46**							
14	ICT	.14	.35	-,26**	.05	.15	.09	-.08	.04	-.06	-.07	.05	.03	,31**	-,25*	-,30**						
15	Other	.13	.33	-.03	-.08	-,16*	-.15	-.12	-.07	-.10	-.04	-,19*	-.04	-.06	-,23*	-,28**	-.15					
Study variables																						
16	Exploration	4.39	1.09	-,19*	.09	.12	.01	-,20*	.08	-.03	.01	-.05	,26**	.11	-.03	-.07	,20*	-.03				
17	Exploitation	4.96	.82	-.09	.06	,19*	.06	.00	.15	.04	.08	-.06	,24**	.01	-.02	.00	.07	-.08	,48**			
18	Present Focus	4.67	1.07	-.01	.04	.00	-.04	-.06	-.03	-.08	.03	.06	-.15	-.10	.01	.04	-.03	.04	-.08	.00		
19	Future Focus	5.45	.92	-.07	-.03	-.02	.08	-.04	.08	.04	-.03	-.02	,20*	-.01	-.04	-.01	-.01	.08	,21**	,25**	-.03	
20	Environmental Dynamism	4.18	1.08	-.08	,17*	-.07	-.06	.02	,19*	-.04	-.10	-.11	,21*	.08	-,19*	.04	,17*	-.03	,48**	,27**	,18*	.11

4.2 Hypotheses testing

We tested our hypotheses in three models using the stepwise hierarchical ordinary least squares regression approach as for linear models such ours this approach generates unbiased coefficient estimates that tend to be relatively close to the true population values (minimum variance) (Aiken and West 1991; Sserwanga and Rooks 2014). In Model 1, we entered only the control variables. In Model 2, we added the main effects of CEO's temporal focus and environmental dynamism. In Model 3, interaction terms are included. Table C-7 and Table C-8 present the

Table C-7: Results of OLS regression analyses: Effects of temporal focus and environmental dynamism on exploitative innovation

	Model 1		Model 2		Model 3	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploitation						
Controls						
Age (CEO)	-0.01	0.01	-0.01	0.01	0.00	0.01
Age (TMT)	0.00	0.01	0.00	0.01	0.00	0.01
Education (CEO)	0.24*	0.11	0.26*	0.11	0.26*	0.10
Education (TMT)	0.00	0.10	-0.02	0.10	-0.03	0.10
Tenure (CEO)	0.01	0.01	0.00	0.01	0.01	0.01
Tenure (TMT)	0.01	0.01	0.01	0.01	0.01	0.01
Firm Age	0.00	0.01	0.00	0.01	0.00	0.01
Firm Size	0.00	0.00	0.00	0.00	0.00	0.00
TMT Size	0.00	0.00	0.00	0.00	0.00	0.00
Slack Resources	-0.05	0.05	-0.06	0.05	-0.05	0.05
R&D Expenditure	0.17*	0.08	0.11	0.08	0.08	0.08
Manufactoring	-0.06	0.28	0.02	0.28	-0.08	0.27
Professional and technical services	0.07	0.28	0.02	0.27	-0.02	0.26
ICT	0.18	0.32	0.07	0.32	0.11	0.31
Other	0.01	0.32	-0.04	0.31	-0.09	0.30
Main effects						
Present Focus			0.02	0.07	-0.80*	0.33
Future Focus			0.15	0.08	1.05**	0.39
Environmental Dynamism			0.17*	0.08	0.59	0.58
Interaction effect						
Present Focus x Environmental Dynamism					0.19*	0.08
Future Focus x Environmental Dynamism					-0.23*	0.09
R^2		0.14		0.21		0.28
ΔR^2				0.03		0.07
R^2 *Adj.*		0.03		0.08		0.14
ΔR^2 Adj.				0.03		0.07
F Change		1.24		4.49*		5.00**

* $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

Table C-8: Results of OLS regression analyses: Effects of temporal focus and environmental dynamism on exploratory innovation

	Model 1		Model 2		Model 3	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploitation						
Controls						
Age (CEO)	-0.01	0.01	0.00	0.01	0.00	0.01
Age (TMT)	0.00	0.01	0.00	0.01	0.00	0.01
Education (CEO)	0.08	0.14	0.14	0.13	0.14	0.13
Education (TMT)	0.06	0.14	0.00	0.12	0.00	0.12
Tenure (CEO)	-0.02	0.01	-0.02*	0.01	-0.02*	0.01
Tenure (TMT)	0.02	0.01	0.01	0.01	0.01	0.01
Firm Age	0.00	0.02	0.00	0.01	0.00	0.01
Firm Size	0.00	0.00	0.00	0.00	0.00	0.00
TMT Size	0.00	0.00	0.00	0.00	0.00	0.00
Slack Resources	-0.02	0.06	-0.01	0.06	0.00	0.06
R&D Expenditure	0.26*	0.10	0.10	0.10	0.08	0.10
Manufactoring	-0.01	0.37	0.21	0.33	0.14	0.33
Professional and technical services	0.08	0.36	0.01	0.32	-0.02	0.32
ICT	0.52	0.42	0.19	0.38	0.23	0.38
Other	0.14	0.41	0.12	0.37	0.09	0.37
Main effects						
Present Focus			-0.18*	0.08	-0.77	0.40
Future Focus			0.19*	0.10	0.85	0.47
Environmental Dynamism			0.50***	0.09	0.82	0.70
Interaction effect						
Present Focus x Environmental Dynamism					0.14	0.09
Future Focus x Environmental Dynamism					-0.17	0.11
R^2		0.16		0.36		0.38
ΔR^2				0.17		0.02
R^2 *Adj.*		0.05		0.26		0.27
ΔR^2 Adj.				0.17		0.02
F Change		1.46		28.52***		1.78

* $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

results of our analyses for the two types of innovation exploitation and exploration. Hypotheses 1 to 4 proposed a direct relationship of CEO temporal focus and the two forms of innovation. Model 2 in Table C-7 for exploitation and Table C-8 for exploration, respectively, show that there is no significant relation between a present focus and exploitation, contrary to our suggestions in Hypothesis 1 (B = 0.02, $p > 0.05$). In Hypothesis 2, we proposed a negative relationship of a CEO present focus and exploration which found support by the data (B = -0.18, $p < 0.05$). Hypotheses 3 and 4 were about a negative effect of a future focus on exploitative and a positive effect on explorative innovation. For Hypothesis 3, the data shows no evidence for a negative relationship between a future focus and exploitation (B = 0.15, $p > 0.05$).

Hypothesis 4 is supported, a future focus is significantly positive associated with exploration (B = 0.19, $p < 0.05$).

Hypotheses 5 to 8 proposed a moderating relationship of CEO temporal focus and environmental dynamism on the two forms of innovation – exploitation and exploration. We tested the interaction effects of CEO temporal focus and environmental dynamism on exploitation and exploration (hypotheses 5–8) in two different models. The main interaction terms are displayed in Model 3 in Table C-7 for exploitation and Table C-8 for exploration, respectively. In addition to the multiplicative interaction terms of the two temporal foci times environmental dynamism we conducted conditional tests for the moderation at different values of the moderator to prevent the risk of understating or overstating moderation effects (Kingsley et al. 2017; Hayes 2017b; Brambor et al. 2006). Thus, we calculated marginal effects of temporal focus and the corresponding standard errors of environmental dynamism (while holding all controls constant) with the PROCESS tool for SPSS developed by Hayes (2017a). As suggested by Kingsley et al. (2017) for a continuous moderating variables, we produced a graph of the marginal effect line along with 95% confidence intervals around the line that shows if a marginal effect is statistically significant at each value of the moderator. The corresponding graphs are depicted in Figure C-2 for exploitative innovation and in Figure C-3 for explorative innovation.

In Hypothesis 5, we predicted that a CEO present focus will lead to more exploitation in dynamic environments than in stable environments. The interaction term of executive's present focus and environmental dynamism is significant and positive (B = 0.19, $p < 0.05$) which shows support for H5. Further analysis of the marginal effect plot (Figure C-2, left plot) shows that the 95% confidence interval is above zero at values of the moderator greater than 5.13 and not for values below that point. Approximately 22.5% of the sample falls within the region of significance. We found no support for H6, in which we suggested a negative interaction between

a present focus and environmental dynamism for explorative innovation (B = 0.14, $p > 0.05$, and none of the marginal effects reaching significance).

Hypothesis 7 which suggested a positive interaction of a CEO's future focus and environmental dynamism for explorative innovation did not find support either. The main interaction term is non-significant (B = -0.17, $p > 0.05$) and marginal effects are only significant within a range of low to medium values of the moderator (Figure C-3, right plot). A comparison of the effect of a CEO's future focus at high and low values of environmental dynamism shows no support for an interaction. Hence, we reject H7. Hypotheses 8 proposed that the negative relationship between a CEO future focus and exploitative innovation is stronger in dynamic than in stable markets. The interaction term of CEO future focus × environmental dynamism is significant and negative for exploitation (B = -0.23, $p < 0.05$). This in line with the theorizing of *H8*, however, marginal effects and the corresponding plot show that the lower 95% confidence interval crosses zero at 4.03 of environmental dynamism and the interaction is only significant for values of the moderator smaller than 4.03 (Figure C-3, right plot). This means that the influence of CEO's future focus becomes stronger the more stable environment is which is the opposite direction as what we hypothesized. Hence, we are rejecting H8.

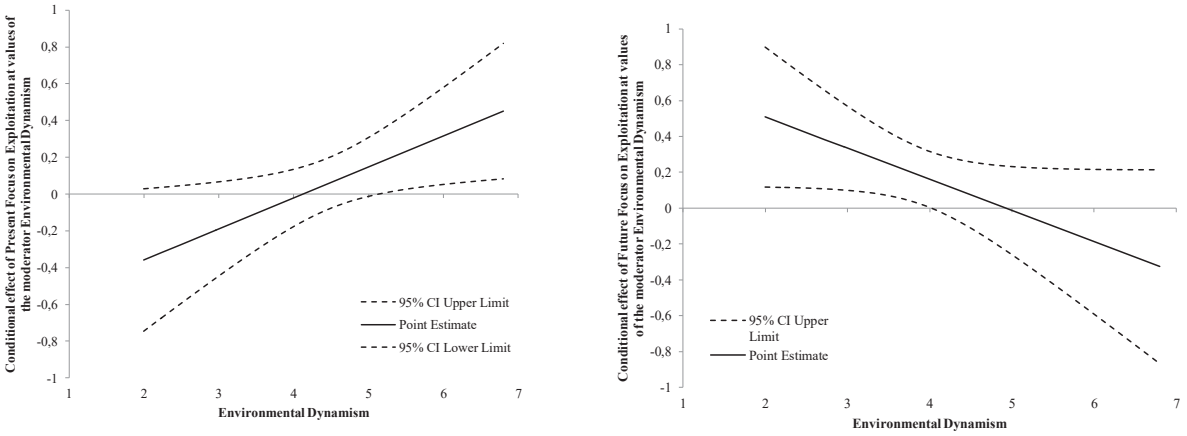

Figure C-2: Interaction effects of temporal focus and environmental dynamism on exploitative innovation

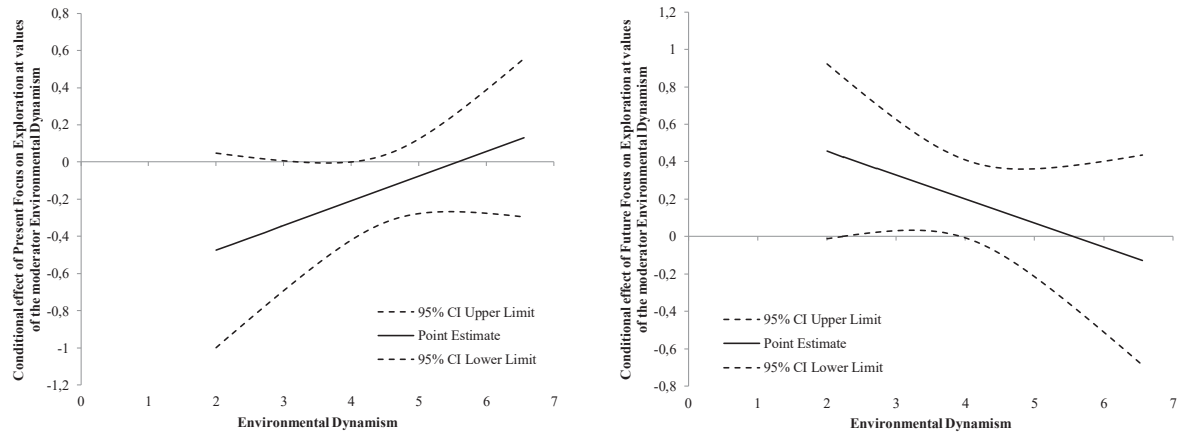

Figure C-3: Interaction effects of temporal focus and environmental dynamism on explorative innovation

5 Discussion

This study's purpose is to examine the differential impact of a CEO's temporal focus (Bluedorn 2002; Shipp et al. 2009; Zimbardo and Boyd 1999), on exploratory and exploitative innovation in SMEs. We therewith heed to calls of prior research that empirical research is needed to examine the relationship of temporal foci (i.e. a present and future focus) and its influence on exploitation and exploration strategies, especially in SMEs (Brigham et al. 2014). Further,

environmental conditions can influence the impact of temporal focus on the different forms of innovation. In doing so, we aim to advance theory on executive's characteristics in firm decision-making and literature on entrepreneurship in later stages of a firm's life cycle.

Our data shows that executives vary in the degree they characteristically devote attention to the present or future and that these differences explain additional variance in exploitative and exploratory innovation beyond firm variables such as size, firm age, slack resources, R&D expenditure or industry. By drawing on the psychological concept of temporal focus (Shipp et al. 2009; Bluedorn 2002; Zimbardo and Boyd 1999), we propose in line with prior literature that CEO temporal focus may serve as an attentional filter in determining how current real-time information and future projections drive forms of innovation (Nadkarni and Chen 2014), particularly in SMEs. We nuance prior findings however by distinguishing between different types of innovation, namely exploitation and exploration. This differentiation is important to make as empirical research pointed out that too little of either exploitation or exploration reduces innovation outcomes and firm performance (Levinthal and March 1993; He and Wong 2004; Katila and Ahuja 2002; Greve 2007).

Contrary to our expectations, we found no direct relationship of a CEO's present and future focus with exploitative innovation and that a CEO's temporal focus is not associated with exploitative innovation without considering the external environment. When examining the contingency of environmental dynamism, we found that a CEO's present focus leads to significantly more exploitative innovation in dynamic environments than in stable environments. We also found an interaction of CEO future focus and environmental dynamism; however, marginal effects of the interaction are only significant for stable environments. This contingency upon environmental conditions is in line with research that has regarded environmental dynamism as key factor in understanding how CEOs act, behave and respond (Akgün *et al.*, 2008; Ensley *et al.*, 2006; Schilke, 2014). For our data this is only the case for exploitative innovation, however

and not for explorative innovation. When environments are dynamic and change unpredictably, particularly CEO's with a present focus seemed to be prone to exploitation. CEO's with a present focus put an emphasis on the needs of today (Shipp et al. 2009) and are motivated by instant feedback (Shipp et al. 2009). This instant feedback is what CEO's receive for incremental adaptations to products or process improvements in dynamic markets. Our finding, that a CEO future focus has a stronger effect on exploitative innovations, the more stable the environment is not as hypothesized - we expected that a future in CEOs leads to negative inclinations towards exploitation when environments are dynamic. This may be explained by Benner and Tushman (2003, p. 249) notion that "During eras of incremental change, organizations that sustain incremental innovation will be more effective than those that initiate variance-increasing innovation". The authors point out than exploitative innovation activities are found to be more successful in the stable auto industry but not in the dynamic computer industry (Ittner and Larcker 1997). This means it might be the case that a future focus in CEOs lets them anticipate that greater consistency and efficiency – i.e. exploitative innovations rather than explorative innovations – will benefit their firm more when the environment is more stable and predictable.

For explorative innovation, we found a direct relationship with both hypothesized temporal foci. We expected a CEO present focus to be negatively associated with explorative innovation while a CEO future focus is positively associated with it. The theorized association finds support from our analyses. This observation enforces the notion that a present focus in CEOs leads to more attention on the handling of day-to-day matters than to those of tomorrow (Finkelstein, 2005; Khurana, 2002; Tripsas and Gavetti, 2000) while a future focus in CEOs is related to a forward-looking cognition, a more distant search opportunities of their firms and thus, to radical innovations (Gavetti and Levinthal 2000). The hypothesized interaction effects with a CEO's future focus and environmental dynamism on exploitative and explorative innovation were

rejected by our analyses. This suggests that a CEO future focus has a direct influence on the choice of exploitation and exploration, notwithstanding of environmental conditions.

Our study advances theory on subjective time perception in strategic decision-making (Yadav et al. 2007; Nadkarni and Chen 2014) and provides new insights on how the CEOs' temporal focus affects different types of innovation in SMEs. Thereby, we contribute to the emerging literature of subjective time perception in management decisions and to the still nascent research on individual factors explaining preferences towards the two different forms of innovation – exploitation and exploration (Gupta et al. 2006; Ahmadi et al. 2017). Our results suggest that explorative innovation is directly influenced by the CEOs temporal disposition – it is positively affected by a CEOs future focus and negatively impacted by a CEOs present focus. For exploitative innovation, the influence of a CEO temporal focus not universal but the environmental context is critical in determining whether and in what direction exploitation is influenced.

6 Limitations and Future Research

As with most empirical work, our study has several limitations that that raises opportunities for future research. First, while our study investigated the relationship of CEO's temporal focus and exploitative and exploratory innovation, we did not explicitly test the simultaneous appearance of these two innovation outcomes (ambidexterity). Prior research has shown it is important for a firm's long-term success that the firm is able to create short-term efficiency gains from improving processes and products, i.e. exploitative innovations, while at the same time pursuing long-term goal oriented activities, i.e. explorative innovations (Koberg et al. 2003; March 1991; Kammerlander et al. 2015; Ahmadi et al. 2017). Firms dealing only with exploratory innovation and excluding exploitative innovation will incur high costs for experimentation and discovery

without obtaining many of the benefits they would have with exploitation. Developments will be underdeveloped with too little distinctive competence. Conversely, companies that only exploit without exploration are likely to be trapped in sub-optimal stable equilibria. Therefore, maintaining an appropriate balance between exploration and exploitation is essential to the progress and prosperity of firms (March 1991, p. 71). Despite advancement in ambidexterity research, "determinants that relate to the personality of the CEO are still poorly understood" (Kammerlander et al. 2015, p. 583). Given the findings of our study, we encourage researchers to conduct future studies to assess the link between CEO's temporal focus and ambidexterity.

Secondly, we have analyzed CEO temporal focus as two independent factors considering different combinations of CEO temporal profiles. Conceptual notions mention that combinations of different profiles of temporal focus are possible, for instance if CEOs are high on the dimensions of present focus and future focus simultaneously, this would be referred to as "hyper-temporal" and if they were low on both dimensions, this would be referred to as "atemporal" (Shipp et al. 2009). While we did not explicitly test for those combinations, prior research states that the dimensions of temporal focus have independent effects – i.e. for instance a present focus is not dependent on a future focus or vice versa – indicating that the temporal focus is best considered as separate effects of present focus and future focus (Shipp et al. 2009; Nadkarni and Chen 2014). Furthermore, according to our theorizing combinations of a temporal focus would cancel each other out in their effect on exploitative and exploratory innovation as we expected a CEO present focus to increase exploitative innovation while decreasing explorative innovation and the opposite for a CEO future focus. However, a fruitful avenue for future research could be the investigation of different combinations of temporal focus profiles in relation to ambidexterity. As ambidexterity conceptualizes combinations of exploitative and explorative innovations which might be explained partly through CEO temporal profile combinations.

Thirdly, our data is cross-sectional, was captured at a single point of time, and uses perceptual scales, highlighting issues of common method bias and causal reciprocity. Concerning the issue of common method bias, it should be stated that the data on the dependent variables and the predictor variables come from different informants, namely the CEO and a TMT member, which reduces the common method variance bias. Additional ex-post assessment of common method variance did not show indication of potential issues (see subsection 3.2 Measurements). As indicated, our data is suited to establish relationships between the constructs but causality cannot be inferred. While it is conceivable that CEO temporal focus influences the pursuit of exploitative and exploratory innovation, it might be the case that a long tenure or a prior firm orientation on exploitation or exploration might have had an impact on a CEO's temporal focus. We addressed this issue by including CEO's tenure and age as a control variable. Furthermore, previous research states that temporal focus is developed through childhood experiences and provided some empirical evidence for the quite stable nature of temporal focus (Shipp et al. 2009). Thus, it is indicated that reverse causality is relatively unlikely. However, to create more insight in the direction of causality, future studies may adopt a longitudinal approach to increase insight into how temporal focus causally relates to exploitative and exploratory innovation.

Fourthly, our investigation is restricted to SME firms from the Netherlands and thus, may not be fully representative for all SME companies. For instance, Chishima et al. (2017) show that there are cultural differences in temporal focus between participants of the United Kingdom and Japan, and that there are temporal focus clusters that relate differently to other psychological constructs such as self-esteem. The cultural specificity of relationships between temporal focus and other personality control variables needs further conceptual and empirical investigation.

Lastly, our measure of CEO's temporal focus was written in third personal plural, i.e. that included the term "we" instead of "I". However, interrater agreement scores do not indicate any

similarities between the temporal focus of the CEO and the TMT member of the firm as interrater reliabilities indicated very poor levels of agreement (see subsection 3.2 Measurements). The poor levels of interrater agreement indicate responses on the individual level rather than on the team level despite the inclusion of the term "we". Nevertheless, future research on temporal focus in teams would also be of high interest. Subjective perception of time has proven to be a persistent factor that explains differences in individuals (e.g. Bluedorn, 2002; Shipp, Edwards, and Lambert, 2009; Zimbardo and Boyd, 1999). Therefore, team compositions of members with characteristic differences in their temporal focus could influence the team's performance - be it positive or negative. If the underlying cause of successes or problems in teams is based on differences in temporal focus, but this is not recognized, different types of interventions and training programs cannot work, since it is not at all clear where to start (Mohammed and Harrison, 2013). The resulting question is how a team should be composed in order to work as effectively as possible and achieve better results. There is increasing conceptional interest and arising empirical studies on time-based personality traits in teams (e.g. Mohammed and Harrison 2007; Mohammed and Nadkarni 2011; Montoya-Weiss et al. 2001; Nordqvist et al. 2004; Kabanoff and Keegan 2009) and an examination of temporal focus in teams could contribute to this nascent research stream.

7 Managerial Implications

This study has important practical implications. Our results support the claim that CEO's temporal focus influences executive decision-making and the pursuing of different innovation directions. This insight is particularly relevant for CEO hiring decisions. Depending on the needs of the firms, owners of SME firms are advised to pay attention of CEO's temporal disposition. It is estimated that "senior management is devoting less than 3% […] of its energy to building

a corporate perspective of the future" (Prahalad and Hamel 1994, p. 4). When owners need their firm to be forearmed for long-term goal achievements they should search for CEO with a future focus. A present focus on the contrary does not necessarily have to be harmful for the firm as it is depending on the environment in which the firm is acting. A present focus in CEOs can be of advantage for using real-time information to handle immediate challenges more quickly and maintaining a level excellence that has been achieved (Yadav *et al.*, 2007). However, for long-term prosperity and concerning explorative innovation activities, we could show direct negative effects of a CEO present focus. Thus, particularly firms that require deviations from the current status with regard to their business model and need to achieve something new should whether potential CEO candidates are characterized by high levels of future focus. Furthermore, we could show that a CEO present focus leads towards more exploitative innovation activities when environments are dynamic and prior research shows that especially in dynamic environments it is rather explorative innovation that lead to positive performance outcomes (Jansen et al. 2009; Jansen et al. 2006). Therefore, a future focus is particularly important in dynamic environments, as a present focus could potentially lead to inappropriate decisions in such environments as our results show. If the company has already hired a present focused CEO, two options could be considered. First, although psychological research has identified temporal focus as a relatively stable personality trait, general psychological research is still inconclusive about whether and to what extent personality traits can be deliberately changed (Roberts et al. 2006; Kammerlander et al. 2015). For example, awareness of the existence of temporal focus and the shortfalls that are associated with a respective dimension of it could assist CEOs to evaluate their decisions-making more critically and, if necessary, seek advice. Second, research on minority dissent proposes that active contradiction or opposition against currently assumed ideas or policies can lead to better decisions and more innovation (De Dreu, Carsten K. W. and West 2001; Kammerlander et al. 2015). Hence, CEOs may be good advised to include people

with high levels of future focus in their top management teams or group of advisors. Ultimately, it is important that CEOs of SME firms recognize the need of forward thinking and tackling the future of their firms regardless what temporal disposition they have.

D Study 3: The Influence of Temporal Focus on Exploratory and Exploitative Innovation

Authors, affiliation, and share of contribution:

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Author contributions:

David Prinz developed the model and designed research.

David Prinz performed research.

David Prinz analyzed the data and wrote the paper.

David Prinz

1 Introduction

Individual perceptions of time may act as cognitive filters that shape evaluations of decision situations, general strategic initiatives and judgements (Shi et al. 2012; Chen and Nadkarni 2017), as well as timing of strategic activities (Das 1987, 2004). If people focus only on the here-and-now, this may lead them to exclude long-term profitable alternatives from their decision filter if those alternatives do not deliver measurable short-term results (Marginson and McAulay 2008). Accordingly, the higher valuation and focus on short-term success can lead to an inhibition of innovation and of further development (van Everdingen and Waarts 2003). If such a distortion and short-term view exists in decision-makers of companies, this may lead to a reduction in competitiveness and economic instability in the long run (Souder and Bromiley 2012). Individual judgements, views and perceptions are essential factors in decision-making which can impact the evaluation of alternatives, the ultimate decision, and behavior (Das 2004; D'Aveni et al. 2010; Bridoux et al. 2013; Nadkarni et al. 2016). However, people often do not realize that they are influenced by their personal perceptions and that their decision-making is no longer based on rational consideration of alternatives but on their own assumptions (Grondin 2010). One dimension of individual perceptions can refer to the subjective view of time (Shipp et al. 2009; Zimbardo and Boyd 1999). A subjective view of time "implies that in the present moment individuals may recollect the past, perceive the present, and anticipate the future" (Shipp et al. 2009, p. 1). Mental resources compete with each other as we cannot think of the past, present, and future simultaneously. Rather, individuals allocate their attention to a certain time period. Depending on the context, people can vary their attentional focus (Nuttin 1985), however, there are dispositions and general tendencies towards a certain time period (Zimbardo and Boyd 1999; Shipp et al. 2009).

A subjective view of time can operate "as a reference point for the strategic decision maker" (Marginson and McAulay 2008, p. 273) and this impacts choices of persons in charge. However, research on this topic is still nascent and will benefit from further advancement and examination. To address this discussion and expand current knowledge, this study investigates the relationship of individual's temporal focus – how they devote characteristically attention to the past, present, or future (Shipp et al. 2009) – and innovation activities in companies.

The concept of temporal focus is particularly relevant for the innovation context as decision-makers have to attend current market activities as well as future conjectures. Innovations are a fundamental organizational output for a firm's viability and also create paths for socio-economic change (Sørensen and Stuart 2000). While it has become a popular field for strategic management scholars to study antecedents of innovation, most research has concentrated on the firm level (Benner and Tushman 2003; Jansen et al. 2006; Uotila et al. 2009). While decision-making on the individual level plays a critical role in innovation activities (Sitkin et al. 2011), our understanding of how psychological traits or attributes may influence individual decision towards different forms of innovation is underdeveloped and recent research emphasizes the need to examine antecedents of individual-level innovation decisions (Mom et al. 2015; Ahmadi et al. 2017). Following previous research, I differentiate explorative and exploitative innovation activities (March 1991; Levinthal and March 1993; Benner and Tushman 2002; Benner and Tushman 2003). Exploitative innovations refer to refinement and efficiency while explorative innovations concentrate on discovery and experimentation (March 1991). Exploitation can be achieved at lower costs and aims at incremental innovations to produce short-term gains (Benner and Tushman 2002). Exploration on the other hand is typically costlier, but also it is considered more important for long-term success (Jansen et al. 2006). Despite previous calls for research to investigate the influence of an individual's temporal focus to decisions towards exploration and exploitation (Brigham et al. 2014), to the best of my knowledge, there

is no published study so far examining this relationship. This is important because it is the individual manager or decision-maker in charge who enables the allocation of resources and implementing organizational structures towards exploration and exploitation (Benner and Tushman 2003; Ahmadi et al. 2017).

In the strategic management literature, environmental conditions and the context in which individuals act in are considered as determining factor for decision-making (Hambrick, 2007; Hambrick, Finkelstein, and Mooney, 2005). One key environmental facet is environmental dynamism, which is the degree of instability and unpredictability of the external environment (Dess and Beard, 1984; Jansen et al., 2006). Recent studies found indications that the relationship of temporal focus on innovation activities is contingent on how dynamic the environment is (Prinz et al. 2019; Nadkarni and Chen 2014). Building upon a previous study with experienced company leaders (Prinz et al. 2019), I want to further validate the influence of environmental dynamism on the relationship between temporal focus and innovation by using an experimental setting and examine whether differences in decision-making are systematic based on environmental conditions.

Specifically, I suggest that future focus is positively related to explorative innovation and negatively related to exploitative innovation. For a present focus, I expect that it will be negatively related to explorative innovation and positively related to exploitative innovation. Furthermore, I propose that this relationship depends on the environmental context.

To test the proposed model, two survey experiments were conducted via Amazon Mechanical Turk with 104 participants in the first and 117 participants in the second experiment. The study contributes to the literature in three ways. First, although research of subjective views of time has gained interest in recent years (Chishima et al. 2017), this is still a nascent field of research and there is a lack of studies examining the implications of time perceptions in business

decisions. Prior research has linked the concept of temporal focus to the rate of new product development (Nadkarni and Chen, 2014) and innovation outcomes (Yadav et al. 2007). One previous study finds indications of a relationship of CEO's temporal focus to the pursuit of explorative and exploitative innovation with survey data in small and medium-sized enterprises (Prinz et al. 2019). To further advance our understanding of the influence of time perceptions in innovation decisions, this study aims to examine if there are systematic differences between individuals towards innovation decisions based on their temporal focus. Furthermore, the few existing studies investigated solely experienced managers whose time perceptions are more likely primed by the context and this might lead to endogeneity as decision-makers with certain time perceptions may self-select themselves to particular strategic contexts or become selected by others because of their perceptions (Westphal and Zajac 1995; Nadkarni and Chen 2014; Prinz et al. 2019). To set this concern aside, I developed vignettes settings and a sample with various backgrounds instead of experienced managers to test my hypotheses. Second, exploration and exploitation has mostly been investigated as a firm-level construct and studies at the individual level and the antecedents of exploitation and exploration based on individuals' characteristics are scarce (Ahmadi et al. 2017; Laureiro-Martínez et al. 2015; Lavie et al. 2010). As also few empirical studies have had limited or mixed evidence on individual antecedents of exploration and exploitation (Lavie et al. 2010), I use a more controlled empirical setting to isolate the decision-making context. Additionally, with the examination of how an individual's temporal focus impacts innovation decisions, this study seeks to advance our understanding of how cognitive attributes as decision antecedents influence individuals' alignment towards explorative and exploitative innovation. Third, a growing body of research has regarded environmental dynamism as a key factor in understanding how individuals act, behave and respond in different contexts (Akgün et al. 2008; Ensley et al. 2006; Schilke 2014). Therefore, this study deals with the question of the extent to which environmental dynamics influence the

relationship between temporal focus and decision and whether, for example, high dynamics have a strong influence on innovative strength.

The study is structured as follows. At first, I review the current literature on temporal focus and innovation decisions before I develop a conceptual model and derive my hypotheses. Afterwards, I discuss my research strategy and provide details about data collection, sample and the measurement instruments in the method section. Thereupon, I present empirical findings and conclude with a discussion of results, limitations and avenues for future research.

2 Hypotheses Development

2.1 Temporal Focus

The concept of temporal focus is defined as "the attention individuals devote to thinking about the past, present, and future" (Shipp et al. 2009, p. 1) and thus, the allocation of attention to a certain time period. Psychological interest about different individual views of time has evolved more than seven decades ago (Lewin 1942) and has grown in popularity since the seminal study about individual's time perspective of Zimbardo and Boyd (1999). Central is the consideration that the view, frame or bias towards a certain time – past, present or future - influences a person's decisions and actions. Time perspective is a broad term for a multifaced and overarching concept towards various views related to time, temporal focus can be viewed as one component of time perspective that relates to the extent decision-makers characteristically devote their attention to the past, present, and future (Shipp et al. 2009, p. 3). The concept of temporal focus is considered as a relatively stable individual difference, which evolves over time and is determined by many learned factors, such as national culture, parental beliefs about time, education, occupation, and personal experiences (Shipp et al. 2009; Zimbardo and Boyd 1999).

While early studies on time perception treated temporal focus as a continuum where individuals are pronounced towards either past, present or future (de Volder and Lens 1982; Nuttin 1985), more recent research emphasized that different time perspectives are distinct dimensions, which are best represented by separate effects of different times instead of points on a continuum. Hence, temporal focus represents the general tendency to focus on particular time periods to varying degrees (Zimbardo and Boyd 1999; Shipp et al. 2009).

The construct of temporal focus captures attentional preferences for either the past, the present and/or the future, this study's focus is on a present and future focus in individuals. While a past focus is a robust predictor for emotional outcomes (e.g. Stolarski et al. 2014), a present and a future focus have been shown to impact decisions and behavior (Jochemczyk et al. 2017; Chittaro and Vianello 2013).

A strong present focus is associated with a "here and now" framing in decision-making which may lead to emphasizing current opportunities, spontaneous behavior, inattentive of possible consequences (Shipp et al. 2009; Nadkarni and Chen 2014). In contrast, a high future focus refers to an emphasis on events that are yet to occur (Chandy and Tellis 1998) and thus, on prospective goals, anticipated outcomes and general developments in strategic decision contexts (Yadav et al. 2007).

2.2 Temporal Focus and the Pursuit of Exploitative and Explorative Innovation

Following an established stream of the management literature, innovation is classified along the two distinctions: (1) explorative innovations, defined as radical innovations that involve discovery and experimentation. Those innovations require new knowledge and deviation from the already known (Levinthal and March 1993; March 1991). These types of innovations are

designed to meet needs of, for instance, new markets or emerging customer demands and offer new technologies, create new markets, and develop new distribution channels (Benner and Tushman 2003; Jansen et al. 2006; Levinthal and March 1993). (2) exploitative innovations, classified as incremental innovations that involve refinement and efficiency (Levinthal and March 1993; Jansen et al. 2006; Benner and Tushman 2003). These innovations are usually built up on already existing technologies, products, and services and are designed to meet needs of current markets or customers. This could be for example increasing the efficiency of existing processes, expand a product line with minor features, improve an established design, or broaden existing knowledge and skills (Jansen et al. 2006; Abernathy and Clark 1985).

A key role in determining whether an organization sets an explorative or exploitative innovation strategy is played by its decision-makers in charge (Gibson and Birkinshaw 2004; O'Reilly and Tushman 2011; Ahmadi et al. 2017). Lavie et al. (2010, p. 118) point out that manager's subjective perceptions "may drive the organization toward exploration and/or exploitation". However, still relatively little is known about those temporal filters and the individual decision-making mechanisms influencing exploitation and exploration (Laureiro-Martínez et al. 2015; Soo et al. 2013; Ahmadi et al. 2017). This study seeks to add to the current literature by proposing that an individual's temporal focus influences the decisions towards the extent of exploitative and explorative innovation. While this association is untested so far, there are several indications in recent studies between subjective time perception and innovation. For instance, Yadav et al. (2007) found that a future focus in company leaders is positively associated with innovation and its outcomes. Nadkarni and Chen (2014) found that both, a present and future focus in CEOs can positively influence the number of new products a firm launches. As Nadkarni and Chen (2014) point out, a present focus enables quick recognition of new opportunities by providing better understanding of a current market or technology situation and facilitates the implementation of real-time information into innovation ideas (Eisenhardt and Tabrizi 1995).

A future focus leads individuals' attention to prospective technologies and market needs and thus, is associated with higher anticipation and advance preparedness for opportunities yet to occur (Yadav et al. 2007). However, planning and developing for further in the future is difficult, fraught with risk and costly (Helfat 1998; Smith et al. 2005; Nerkar and Roberts 2004). While both, a present and future focus can lead to innovation activities, explorative and exploitative innovation need to be distinguished. This study aims at further nuancing prior findings of temporal attentions on innovation activity (Nadkarni and Chen 2014; Yadav et al. 2007) by differentiating between exploitative and explorative innovation. For example, exploitative activities help companies to learn and adapt rapidly in the short term. Also, investment rewards of exploitative innovation are relatively certain and can be reaped close in time (Benner and Tushman 2002; Jansen et al. 2006; Levinthal and March 1993; March 1991). Explorative innovations can lead to higher rewards in the long run. However, they are much more uncertain and possible rewards lie distant in the future (March 1991; Levinthal and March 1993).

Exploitative innovations may be achieved in a shorter time horizon, from 6 months to two years. These types of innovation pay-off potentially relatively quickly and successes can be achieved within a short time horizon (Zellweger 2007). In contrast, explorative innovation involves probing and developing new technologies and generate new markets (Abernathy and Clark 1985; Benner and Tushman 2003; Levinthal and March 1993). It bears more chances but also more risks and is rather long-term. Particularly, explorative and industry-creating or -changing innovations only pay-off after an appreciable delay of sometimes greater than 10 years (Leifer 2000). Deciding to either opt for long-term innovation, searching for new knowledge and prospective opportunities or choose short term productivity, leveraging current competencies to address the immediate needs "is akin to the problem of deciding whether the present should be hedged for the future" (Lavie et al. 2010, p. 116). This already hints to a proximity of

exploration to a future focus and exploitation to a present focus – at least there is an implicit temporal component inherent in these strategic considerations (Brigham et al. 2014).

2.2.1. The influence of a present focus on exploration and exploitation

I argue that a present focus will be negatively related to explorative innovation while it will be positively related to exploitative innovation. High present focused individuals put an emphasis on the needs of today (Shipp et al. 2009) and tend to discount time more strongly than individuals with a future focus (Daugherty and Brase 2010; Jochemczyk et al. 2017). While such an attentional focus might be essential to maintain a current level of excellence of the firm, it is less likely to be the basis for long-term advancement (Yadav et al. 2007; Chandy and Tellis 1998). Although individuals with a present focus also recognize the need for investing in innovation to keep the firm competitive and successful, I expect that they are more likely to restrict their efforts on types of innovation that lead to a foreseeable success of endeavors and hence, exploitative innovation. A present focus is associated with concentrating on the here-and-now and attending needs of today. This attentional focus on the here-and-now may increase efforts to accelerate innovation projects in terms of bringing a product or service faster to market or implementing production improvements sooner (Lumpkin et al. 2010). This might be of advantage for maintaining the level of excellence a firm may have achieved (Yadav et al. 2007) but on the contrary, a present focus may limit efforts on innovations that are explorative in nature, as the necessary perseverance for radical innovations is missing (Lumpkin et al. 2010). Therefore, I expect that in terms of innovation, individuals with a present focus will have a tendency for optimizing and refining existing winning formulas rather than seeking distant searching, experimenting and departing from the existing where success lays in the far future. They will concentrate on actions where a quick financial gain is possible and thus, a present focus will be positively related to exploitation. In contrast, I expect that a present focus will be

negatively related with exploration where a possible financial gain is linked to high efforts today but results not foreseeable any time soon. Hence, the following hypotheses are:

H1: *A present focus will be negatively associated with exploratory innovation*

H2: *A present focus will be positively associated with exploitative innovation*

2.2.2. The influence of a future focus on exploration and exploitation

A high future focus leads to more awareness and greater anticipation for future events and markets. Moreover, future focused individuals are much more willing to postpone rewards in order to gain benefits in the future (Daugherty and Brase 2010) and this decreases the probability of attending exclusively concerns of the present (Yadav et al. 2007; Lumpkin et al. 2010). Thereby, future focused individuals are associated with planning and aligning long-term strategies that create sustainable advantages in the future (Yadav et al. 2007). A future focus guides individual's attention to future technologies and market needs and thus, is associated with higher anticipation and advance preparedness for opportunities yet to occur. This in turn enables quicker development of radical innovation activities. Furthermore, Chandy and Tellis (1998) suggest that individuals with a future focus are better informed about emerging trends and technologies which makes them less concerned with current technologies and how to optimize them but more about prospective technologies and markets. They are more likely to cannibalize the already existing for the radically new (Chandy and Tellis 1998, p. 479). Thus, they will be likely to pursue explorative innovation and less likely to strive for exploitative innovation. The resulting hypotheses are:

H3: *A future focus will be positively associated with exploratory innovation*

H4: *A future focus will be negatively associated with exploitative innovation*

2.3 The contingent role of the external environment

Research in the field of strategic management and innovation has long acknowledged the important role of the external environment (Garg et al. 2003; Khan and Manopichetwattana 1989; Levinthal and March 1993; Jansen et al. 2009) and the interaction in decision-making of those in charge and their characteristics (Finkelstein et al. 1996; Hambrick 2007). Concerning the impact of temporal focus on managerial decisions, research indicates that specific temporal foci operate differently in specific environmental conditions. As perceptions of the present and the future can be understood as biases or filters on how individuals perceive, evaluate and allocate attention to events, consequences concerning decisions and behavior may be contingent on different environmental states (Huy 2001; Nadkarni and Chen 2014; Nadkarni et al. 2016). In terms of exploration-exploitation decisions, psychological attributes and the external environment are linked and the interaction of the two can have an impact on behavior, decision-making and outcomes (Gupta 1984; Venkatraman 1989; Nadkarni and Chen 2014). One key facet of the external environment is environmental dynamism, in particular concerning exploration and exploitation (Jansen et al. 2009). Environmental dynamism is defined by the extent of unpredictable changes in the external environment (Dess and Beard 1984). This definition includes both volatility, meaning the rate and amount of change, and uncertainty as key characteristics (Miller and Friesen 1983). This is reflected in e.g. the rapidness of technological change or industry structure, customer preferences, and fluctuation in product demand or material supply (Jansen et al. 2006; Jansen et al. 2009; Sørensen and Stuart 2000). A dynamic environment is characterized by a rapid change of external surroundings in an unpredictable manner, thus, increased levels of uncertainty for individuals and firms acting within those dynamic environments (Ensley et al. 2006; Dess and Beard 1984). In highly dynamic environments, changes occur on a regular basis and rapidly; they are less foreseeable or predictable; while in stable

environments the rate of change is small and infrequent, predictable and when changes occur they can be usually anticipated by market participants (Schilke 2014).

When the external environmental changes, incremental or radial innovation becomes essential (March 1991, p. 80) and thus, in dynamic, fast changing environments the pursuit of exploration and exploitation is much more necessary than in stable environment. This reasoning is in line with the managerial discretion argument (Hambrick and Finkelstein 1987; Finkelstein and Hambrick 1990). Managerial discretion is individual's latitude of action. Discretion exists when there are little or no constraints and when there are multiple plausible alternatives for decisions and actions (means-ends ambiguity). The argument proposes that if there is a great deal of discretion present then personal characteristics such as temporal focus will reflect in decision and strategy making (Finkelstein and Boyd 1998; Hambrick 2007). Discretion can emanate from environmental conditions such as environmental dynamism (Hambrick 2007) and several studies have shown that managerial discretion is a focal moderator between decision-makers characteristics and decision outcomes (Finkelstein and Hambrick 1990; Crossland and Hambrick 2011). Drawing on these insights, I expect that environmental dynamism will moderate the influence of temporal focus on exploration and exploitation. Increased dynamism, i.e. instability and uncertainty, in environments raises individuals' latitude in choices. As a consequence, dynamic environments reinforce the impact of characteristics and subjective perceptions – in this case the impact of temporal focus – on decision- and strategy-making (Li and Tang 2010). On the contrary, environments characterized by stability, predictability and infrequent changes are well understood which provides less discretion to individuals and in turn, decreases individuals' latitude. Thus, in stable environments the influence of temporal focus and strategy-making will be mitigated (Hambrick and Finkelstein 1987; Finkelstein and Hambrick 1990; Nadkarni and Chen 2014).

I propose that in dynamic environments, the negative relationship of a present focus and exploration will be stronger, i.e. more negative and that the positive relationship of a present focus and exploitation will be stronger, i.e. more positive. A strong present focus can provide individuals with a more updated view and awareness of current environmental developments. The emphasis on the here-and-now and using real time information to improve processes and find solutions (Zimbardo and Boyd 1999), present focused individuals can use instant feedback from dynamic environments to validate exploitative innovations rapidly and fine tune developments based on that feedback (Nadkarni and Chen 2014). As present focused individuals are particularly motivated by instant feedback rather than by long-term goals (Shipp et al. 2009, p. 18), they will considerate primarily exploitative types of innovation in dynamic environments. Furthermore, Levinthal and Posen (2008, 19) argue that when environments are dynamic, this leads to a devaluation of prior knowledge but also to a reduction of the benefits of investing in new knowledge by pursuing explorative innovation as this will also be degraded by subsequent unpredictable environmental change, i.e. dynamism. Thus, I expect that someone with a present focus will even more concentrate on the here-and-now in dynamic markets and therefore, on exploitative innovation strategies that benefit of usage of current period technologies or markets and trends instead of exploring new technologies for the distant future as those appears to be of even less value when markets are dynamic.

H5: *Environmental dynamism strengthens the negative relationship between a present focus and exploration.*

H6: *Environmental dynamism strengthens the positive relationship between a present focus and exploitation.*

Furthermore, in dynamic environments, the positive relationship of a future focus and exploration will be more positive, and the negative relationship of a future focus and exploitation will be more negative. The tendency of future focused individuals to image and plan for the future is particularly suitable in dynamic environments. Future focused individuals are more inclined towards planning ahead and are stronger influenced by goals that are oriented towards future performance (Shipp et al. 2009). A tried-and-true approach is not applicable as markets are frequently changing. Technological and market information are shifting rapidly and thus, potential for feedback learning is low in terms of future success and opportunities are transient (Atuahene-Gima and Li, 2004; Nadkarni and Chen, 2014).

In dynamic environments, future focused individuals will anticipate that a higher rate of innovation is required in order to survive and therefore, will strive for explorative innovation activities (Lant and Mezias 1992). The focus on the future lets individuals predict that current products and services will become quickly obsolete and require experimentation (Sørensen and Stuart, 2000) and new explorative innovations are required that diverge from existing products, services and markets. When markets are changing fast and unpredictably, it is necessary for future success that new markets are created, new technologies are offered, and new distribution channels are developed (Jansen et al., 2006). Therefore, I expect that a future focus will shift the balance between exploration and exploitation even further towards exploration in a dynamic environment. Dynamic environmental conditions imply discontinuities in the market where technological change is unpredictable or customer demand changes erratically (Gavetti and Levinthal 2000). This reaffirms future focused individuals' negative inclination towards continual, incremental solutions to existing problems, thus increasing the negative impact on relationship between future focus and exploitation. Hence, I propose the following hypotheses:

H7: *Environmental dynamism strengthens the positive relationship between a future focus and exploration.*

H8: *Environmental dynamism strengthens the negative relationship between a future focus and exploitation.*

Figure D-1 shows my theoretical framework.

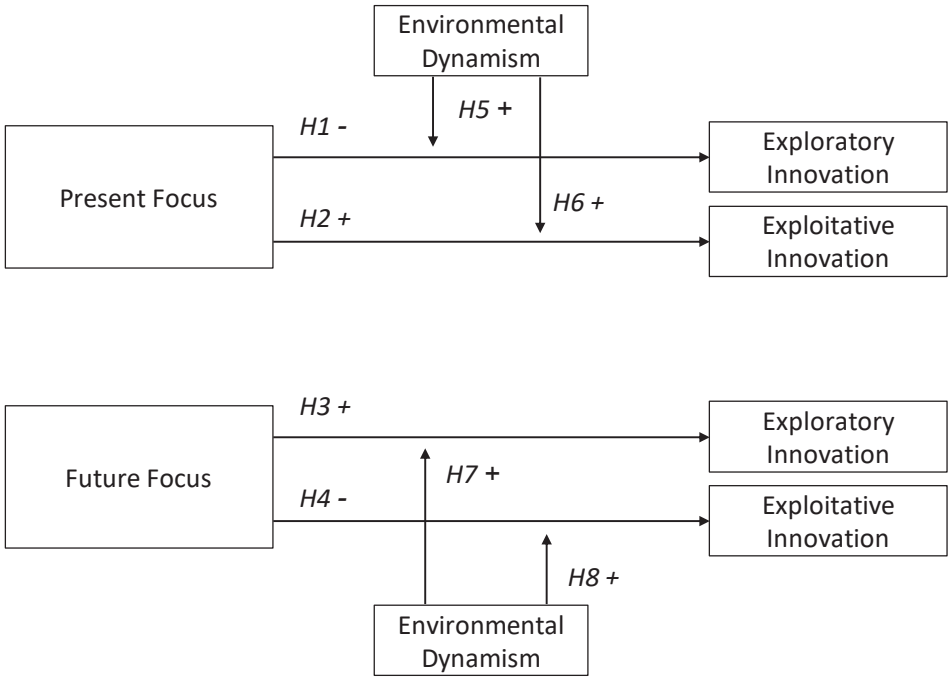

Figure D-1: Research model

3 Methodology

In order to test the hypothesized relationships, I use an experimental survey with hypothetical scenarios in two studies, carried out in April and September 2018. Both studies were conducted on Amazon Mechanical Turk, an online platform. Before conducting the studies, I pre-tested the questionnaire, discussed the clarity, layout, understandability, as well as the overall content validity with several academics and ran a pre-test on Amazon Mechanical Turk with 20 participants.

Temporal focus was measured at the beginning of the experimental survey. Environmental dynamism was manipulated experimentally through the scenarios.

In study 1, I provided participants with a scenario of technology companies in which the decision to explore or to exploit is based on the technological advantage of the company. In order to provide an additional test of the proposed framework and rule out possible effects of a preference for or against the technology industry, I tested the framework in a second study with a different framing. In study 2, the decision towards exploration or exploitation was framed in terms of ecological sustainability.

4 Study 1

4.1 Research setting and participants

Using information from pre-testing, I designed an experimental survey to be carried out on Amazon Mechanical Turk. It allows requesters to specify criteria for participants (called workers) for a particular task or study (called Human Intelligence Task or HIT). Using a sample from the population on Amazon Mechanical Turk instead of real-world innovation managers should protect from pre-existing biases by the context of the job and their roles in this position (Fiet and Patel 2008; Hsu et al. 2017). This suits particularly well to this study's purpose which aims at testing whether individual differences in temporal focus lead to a systematic difference in exploration and exploitation decisions. The sample consisted of United States workers with English as their mother tongue to ensure that participants understand the wording in the scenarios and the subtle nuances of the content.

For study 1, I excluded all participants of the pre-test to rule out possible biases through – what Bentley (2017) calls non-naïveté among participants – the awareness of experimental

conditions. After workers accepted the task, they were provided with an external link to fill out the survey[2]. Each participant was offered a reward of USD 2, - for their participation. In total, 123 workers participated. I had to exclude 19 workers as their answers to the attention-check showed that they did not read or understood the scenario. The attention check was an open text field in which I asked respondents to explain their decision in a few sentences. I read through every answer and if participant's explanation was simply "good" or an obvious copy-paste of sentences from the scenario description, this led me to indicate that their answers are most likely not meaningful for further analysis. I had to drop 15.5% of the answers leading to the study's final sample size is n = 104. In the sample, occupations of participants were distributed as follows: 34 (32.7%) are Professionals, 29 (27.9%) administrative or support personnel, 22 (21.1%) are Managers, 8 (7.7%) Unemployed, 2 (1.9 %) students and 1 (0.7%) Senior Vice, 1 Director and 1 Top Level Executive. Of all participants, 40 (38.5%) had no university degree, 44 (43.2%) had a bachelor's degree, 10 (9.6%) a master's degree, and 10 (9.6%) an advanced degree such as a PhD or MBA.

4.2 Procedure and manipulations

After workers on Amazon Mechanical Turk accepted the task, they are provided with a link to the experimental survey. Participants are told in the beginning that there is no right or wrong answer to prevent any kind of pressure in the situation and that it is important to us that they express their personal opinion and answer honestly. In the first set of questions participants are confronted with the temporal focus scale. Then, participants are confronted with the first of two vignettes. Afterwards, they are asked to think about the case before making any decisions. Subsequently, the dependent variable is measured, followed by an attention and manipulation

[2] The survey was conducted on the online platform SurveyGizmo.

check. Lastly, control variables and demographics are collected, participants are thanked for their participation and received a completion code[3] with which they can be tracked and paid in Amazon Mechanical Turk.

For the setting, I confront participants with two vignettes in which they are asked to be a manager in a company (inspired by Ahmadi et al. 2017). The scenarios and manipulation of environmental dynamism can be found in Appendix A. Two vignettes are used to control for different scenario framings. In the first scenario, participants are asked to set themselves in the position of a digital manager of a mid-sized company that offers B2B solutions, in particular payment systems. The company is currently vetting a digitalization strategy and participants' task is to assist the board in finding an innovation strategy. The board's aim is to offer a new payment system to their major customers and there are two viable solutions possible, one that is explorative and one that is exploitative. In the second scenario, participants are asked to put themselves in the position of a strategic product manager of telecom vendor where now streaming has become a customer demand. That the company intends to develop this technology and offers that in the future has been decided by the executive board and participants are set in the responsible role of managing this case. Again, they are two options presented, one explorative, one exploitative. In both scenarios, the options of exploration and exploitation contains framing words, carefully attended to the literature on exploratory and exploitative innovation. For instance, the explorative option is described as involving *strong renewal and change of current product architecture* and that it would *include the search of radically new technologies*. The exploitative approach on the other hand was described as involving *incremental adaption of currently existing technologies, including improvement and minor changes to current*

[3] To ensure that each completion code is unique, a server technology called *MemCache* was used which stores unique identifier numbers and assures they are exclusive.

technologies. To induce a time sensing, I emphasize that the explorative option has high potential for the long-term future while the exploitative option can bring relatively safely quick returns.

In both scenarios, the manipulation of environmental conditions is operationalized via different descriptions of the environmental context. The sentence framing follows items of the environmental dynamism measure established and validated by Jansen et al. (2009). The study includes three experimental groups: 1) with a stable environment framing, 2) with a dynamic environment framing, and 3) a control group without any environmental framings. This results in a three groups between-subjects experimental design.

The assignment of participants into the three experimental groups was done via the online platform SurveyGizmo using the "php rand function". It randomly chooses a number between 1 and 100 and then assigns that number to the three scenarios with a 33,33% probability for each case.

4.3 Measurements

Dependent variable. The dependent variables "Exploration" and "Exploitation" are measured following each of the two vignettes. As framing sentences for exploration and exploitation was implemented in the scenario, I used a single 7 point-Likert item for each construct, asking how likely it would be that participants would develop the explorative solution or the exploitative, respectively.

Independent variable. To measure the temporal focus of each participant, I used the original and validated scale by Shipp et al. (2009). The total scale consists of 8 items, 4 items each for present, and future. Illustrative items include ''I live my life in the present." for present focus, and ''I focus on my future" for future focus (the full scale can be found in Appendix B). Items

were measured on a 7-point Likert scale describing the frequency with which participants thought about the time frame indicated by the item (1 = never; 3 = sometimes; 5 = frequently; 7 = constantly).

Manipulation check. Respondents were asked to rate the dynamism of the environment as a manipulation check. Therefore, I included an item battery asking about the perception of environmental conditions in the scenario. The items were adapted from a survey scale created by Jansen et al. (2009) which can be found in Appendix B.

As described by Bentley (2017), one of the major challenges with Amazon Mechanical Turk is that participants are not always diligent and may not giving their best effort or do not fully attend the given task which can increase noise and decrease validity in the data. To test for inattentive subjects, I applied an Instructional Manipulation Check (Oppenheimer et al. 2009). The first is to test for inattentive subjects by asking them after each vignette to explain their decision in a few sentences. To not create a tone of distrust, it is important that they are not explicitly marked as attention-check questions (as in e.g. “to show you are paying attention, please select the third option below”) but rather appear more natural and as part of the study (Downs et al. 2010; Bentley 2017). To implement an Instructional Manipulation Check, I asked participants after each vignette to explain their decision in a few sentences. This appears as a natural part of the study and allows conclusion of whether participants read the vignette carefully or not.

An alternative method of screening out inattentive subjects, proposed by Peer et al. (2014) is reputation, which is within Amazon Mechanical Turk workers’ approval rate. The authors found in experimental studies that workers with an approval rate >95% answered attention checks more accurately than workers with an approval rate <95%. While this procedure can reduce but not eliminate inattentive workers. Bentley (2017) suggests the following: to allow

only workers with an approval rate >95%, thus, can reduce low-quality answers and Instructional Manipulation Checks can filter out the remaining. Hence, both screening methods were applied.

After the measurement of the dependent variable, participants were asked to rate the perceived environmental dynamism as a manipulation check. I tested the means of the above described environmental dynamism scale for differences in the two experimental groups. The means and *t*-values for both scenarios in which a manipulation was applied are reported in Table D-1. These results show that for the scenario, the perceived environmental dynamism is significantly different between participants in the two groups. For the second scenario, the *t*-test reveals no significant differences between the "Dynamic" and the "Stable" group. Following recommendations from Kotzian et al. (2015), I did not drop cases based on the results of the failed manipulation checks in order to prevent a bias towards more significant differences between experimental groups and thereby jeopardizing results to be prone to an alpha error.

Table D-1: Mean comparison of perceived environmental dynamism in the two scenarios of Study 1

Variables	N	Mean	Standard Deviation	*t*-test for equality of means
Perc. Dynamism (Scenario 1)				
Dynamic Group	30	5,61	0,72	6,71***
Stable Group	35	3,49	1,70	
Perc. Dynamism (Scenario 2)				
Dynamic Group	30	3,87	2,06	0,95
Stable Group	35	3,39	1,91	

Control variables. I included relevant control variables to test for possible alternative explanations. These controls are subjects' years of relevant experience, age, education, employment status, and risk-taking propensity in my analyses. To control for risk-taking propensity is important to rule out that this disposition confounds effects of the temporal focus disposition as

tendencies toward exploitation and exploration have inherent risk components (March 1991; Levinthal and March 1993; Benner and Tushman 2003). I used a general risk-taking propensity scale validated by Meertens and Lion (2008) (the full scale can be found in Appendix B).

4.4 Analysis and results

Descriptive statistics. Table D-2 shows means and standard deviations of the study variables and correlations among the different constructs. Consistent with previous studies, individuals in my sample tend to prefer exploitation over exploration (March 1991; Jansen et al. 2009) with a significantly higher mean value for exploitation than exploration for both scenarios (Scenario 1: 5.12 vs 3.63, $p < 0.01$; Scenario 2: 4.75 vs 3.79, $p < 0.01$).

Table D-2: Descriptive statistics and correlations for Study 1

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1	Exploration (1)	3,63	1,86										
2	Exploitation (1)	5,12	1,64	-,78**									
3	Exploration (2)	3,79	2,02	,52**	-,34**								
4	Exploitation (2)	4,75	1,83	-,38**	,46**	-,75**							
5	Present Focus	5,17	1,10	,06	-,06	-,02	,05						
6	Future Focus	4,95	1,27	,21*	-,13	,25*	-,25*	,03					
7	Environmental Dynamism	1,41	1,30	-,04	,01	-,06	-,10	,13	-,09				
8	Age	2,54	,98	-,15	,17	-,18	,24*	,02	-,33**	,11			
9	Education Level	3,10	,93	,09	-,17	-,04	,01	,08	,09	,09	-,16		
10	Employment Status	2,55	1,23	-,09	,01	,06	-,11	-,01	-,05	-,05	-,03	-,10	
11	Risk Propensity	3,95	1,51	,44**	-,44**	,45**	-,37**	,13	,25**	-,11	-,17	,04	.34**

* $p < 0.05$, ** $p < 0.01$ (two tailed).

Hypotheses testing. In Table D-3 - Table D-6 I present the results of the stepwise hierarchical ordinary least squares regression (OLS) approach as for linear models such as the one proposed this approach generates unbiased coefficient estimates that tend to be relatively close to the true population values (minimum variance) (Aiken and West 1991; Sserwanga and Rooks 2014). I tested the hypotheses for the two types of innovation exploitation and exploration for each scenario in four different models. The results for scenario 1 (Payment Systems) are shown in Table D-3 (exploration) and Table D-4 (exploitation) and for scenario 2 (Streaming Services) in Table

D-5 (exploration) and Table D-6 (exploitation), respectively). For all tables (Table D-3 – Table D-6), Model 1 tests effects of the control variables *Age, Education Level, Employment Status,* and *Risk Propensity,* while Model 2 tests the direct effects of the independent variable *Temporal Focus*. In Model 3, the moderating variable *Environmental Dynamism* is captured, and interaction effects of the independent variable and the moderating variable are tested in Model 4.

Table D-3: OLS regression analyses: Results for exploration (Scenario 1, Study 1)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploration (Scenario 1)								
Control								
Age	-0.12	0.17	-0.10	0.18	-0.10	0.18	-0.08	0.18
Education level	0.08	0.18	0.08	0.18	0.07	0.18	0.08	0.19
Employment Status	-0.40***	0.14	-0.39***	0.14	-0.39***	0.14	-0.40**	0.15
Risk Propensity	0.64***	0.11	0.63***	0.12	0.63***	0.12	0.62***	0.13
Main effects								
Present Focus			-0.02	0.15	-0.03	0.15	-0.21	0.25
Future Focus			0.07	0.14	0.07	0.14	-0.02	0.22
Environmental Dynamism (D1)					-0.06	0.40	-1.04	2.49
Environmental Dynamism (D2)					0.05	0.40	-3.48	2.63
Interaction effect								
Present Focus x Environmental Dynamism (D1)							-0.02	0.37
Present Focus x Environmental Dynamism (D2)							0.60	0.37
Future Focus x Environmental Dynamism (D1)							0.21	0.33
Future Focus x Environmental Dynamism (D2)							0.09	0.33
R^2		0.27		0.27		0.27		0.30
ΔR^2				0.00		0.00		0.03
R^2 *Adj.*		0.24		0.23		0.21		0.21
ΔR^2 Adj.				-0.02		-0.02		0.00
F Change				0.15		0.04		0.91

* $p < 0.1$; ** $p < 0.05$, *** $p < 0.01$; $N = 104$

Table D-4: OLS regression analyses: Results for exploitation (Scenario 1, Study 1)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploitation (Scenario 1)								
Control								
Age	0.11	0.15	0.13	0.16	0.14	0.16	0.12	0.16
Education level	-0.21	0.16	-0.22	0.16	-0.21	0.16	-0.24	0.17
Employment Status	0.21*	0.12	0.22*	0.13	0.22*	0.13	0.18	0.14
Risk Propensity	-0.52***	0.10	-0.54***	0.11	-0.54***	0.11	-0.50***	0.12
Main effects								
Present Focus			0.03	0.13	0.03	0.14	0.18	0.23
Future Focus			0.05	0.12	0.05	0.13	0.15	0.20
Environmental Dynamism (D1)					0.14	0.35	1.43	2.25
Environmental Dynamism (D2)					-0.07	0.36	2.86	2.38
Interaction effect								
Present Focus x Environmental Dynamism (D1)							-0.18	0.34
Present Focus x Environmental Dynamism (D2)							-0.32	0.34
Future Focus x Environmental Dynamism (D1)							-0.08	0.29
Future Focus x Environmental Dynamism (D2)							-0.26	0.30
R^2		0.25		0.25		0.25		0.26
ΔR^2				0.00		0.00		0.01
R^2 *Adj.*		0.22		0.20		0.19		0.17
ΔR^2 Adj.				-0.01		-0.01		-0.02
F Change				0.10		0.16		0.39

* $p < 0.1$; ** $p < 0.05$, *** $p < 0.01$; $N = 104$

Table D-5: OLS regression analyses: Results for exploration (Scenario 2, Study 1)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploration (Scenario 2)								
Control								
Age	-0.24	0.19	-0.17	0.19	-0.16	0.20	-0.14	0.20
Education level	-0.19	0.20	-0.19	0.20	-0.19	0.20	-0.20	0.21
Employment Status	-0.19	0.16	-0.17	0.16	-0.17	0.16	-0.17	0.17
Risk Propensity	0.63***	0.13	0.61***	0.13	0.61***	0.13	0.62***	0.15
Main effects								
Present Focus			-0.14	0.16	-0.15	0.17	-0.30	0.28
Future Focus			0.18	0.15	0.18	0.15	0.18	0.24
Environmental Dynamism (D1)					-0.06	0.44	-1.23	2.78
Environmental Dynamism (D2)					-0.30	0.45	-1.61	2.94
Interaction effect								
Present Focus x Environmental Dynamism (D1)							0.15	0.42
Present Focus x Environmental Dynamism (D2)							0.33	0.42
Future Focus x Environmental Dynamism (D1)							0.07	0.36
Future Focus x Environmental Dynamism (D2)							-0.08	0.37
R^2		0.23		0.25		0.25		0.26
ΔR^2				0.02		0.00		0.01
R^2 *Adj.*		0.20		0.20		0.19		0.16
ΔR^2 Adj.				-0.01		-0.01		-0.03
F Change				1.08		0.24		0.19

* $p < 0.1$; ** $p < 0.05$, *** $p < 0.01$; $N = 104$

Table D-6: OLS regression analyses: Results for exploitation (Scenario 2, Study 1)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploitation (Scenario 2)								
Control								
Age	0.35**	0.17	0.27	0.18	0.28	0.18	0.28	0.19
Education level	0.11	0.18	0.10	0.18	0.13	0.18	0.17	0.19
Employment Status	0.02	0.15	0.00	0.15	0.00	0.14	0.00	0.16
Risk Propensity	-0.41***	0.12	-0.39***	0.12	-0.41***	0.12	-0.42***	0.13
Main effects								
Present Focus			0.15	0.15	0.19	0.15	0.28	0.25
Future Focus			-0.18	0.14	-0.19	0.14	-0.17	0.22
Environmental Dynamism (D1)					0.66	0.40	2.64	2.54
Environmental Dynamism (D2)					0.88**	0.41	0.54	2.69
Interaction effect								
Present Focus x Environmental Dynamism (D1)							-0.25	0.38
Present Focus x Environmental Dynamism (D2)							-0.01	0.38
Future Focus x Environmental Dynamism (D1)							-0.14	0.33
Future Focus x Environmental Dynamism (D2)							0.09	0.34
R^2		0.17		0.19		0.23		0.24
ΔR^2				0.02		0.04		0.01
R^2 *Adj.*		0.14		0.14		0.17		0.14
ΔR^2 Adj.				0.03		0.03		-0.03
F Change				1.26		2.64*		0.28

* $p < 0.1$; ** $p < 0.05$, *** $p < 0.01$; $N = 104$

Hypotheses 1 to 4 proposed a direct relationship between temporal focus and the two forms of innovation. Results show that there is no significant relation between a present focus and exploration as suggested in Hypothesis 1 (B = -0.02, $p > 0.05$ for scenario 1; B = -0.14, $p > 0.05$ for scenario 2). In Hypothesis 2, I proposed a positive relationship of a present focus and exploitation. This cannot be confirmed by the data (B = 0.03, $p > 0.05$ for scenario 1; B = 0.15, $p > 0.05$ for scenario 2). Hypotheses 3 suggested a positive association of a future focus and exploration, which does not find support either (B = 0.07, $p > 0.05$ for scenario 1; B = 0.18, $p > 0.05$ for scenario 2). The same is true for Hypothesis 4, which assumed a negative association between a future focus and exploitation (B = 0.05, $p > 0.05$ for scenario 1; B = -0.18, $p > 0.05$ scenario 2).

Hypotheses 5 to 8 proposed a moderating relationship of temporal focus and environmental dynamism on the two innovation forms exploration and exploitation. Next, I included the

dummy variables[4] for the experimental groups "*Stable Environment (D1)*" and "*Dynamic Environment (D2)*".

The single effect of the inclusion of the moderator variable is shown in Model 3 and interaction terms are displayed in Model 4. Hypothesis 5 and 6 predicted that dynamic environments strengthen the negative relationship of a present focused and exploration (H5) and the positive relationship between a present focus and exploitation (H6). Both propositions do not find support, however. For exploration, the interaction between a present focus and high dynamism (*Environmental Dynamism D2*) is positive but non-significant (B = 0.60, $p > 0.05$ for scenario 1 and B = 0.33, $p > 0.05$ for scenario 2). For exploitation, respectively, the interaction between a present focus and low dynamism (*Environmental Dynamism D2*) is negative and non-significant for scenario 1 (B = -0.32, $p > 0.05$) and scenario 2 (B = -0.01, $p > 0.05$).

Hypotheses 6 and 7 proposed that a dynamic environment will strengthen the positive association of a future with exploration (H7) and the negative association with exploitation (H8). The results do not show evidence for neither of the hypotheses. For exploration, the interaction between a future focus and high dynamism (*Environmental Dynamism D2*) is neither significant in scenario 1 (B = 0.09, $p > 0.05$) nor in scenario 2 (B = -0.08, $p > 0.05$). For exploitation, respectively, the interaction between a future focus and high dynamism (*Environmental Dynamism D2*) is non-significant for scenario 1 (B = -0.26, $p > 0.05$) and scenario 2 (B = 0.08, $p > 0.05$). I further tested our hypotheses by using the data obtained from manipulation checks as the moderating explanatory variable (Kotzian et al. 2015; Hauser et al. 2018), however, results did not change.

[4] All constellations of dummy baselines were tested, and results did not change. Furthermore, I conducted the tests also for the experimental groups only, i.e. without the control group. The results remain the same, however.

5 Study 2

Study 2 was conducted to provide an additional test of the proposed model and used slightly adapted frame parameters regarding the experimental setting. Adaptions in comparison to Study 1 are the following: First, Study 2 includes an additional scenario, embedded in a different context. While the two scenarios in Study 1 are concerned with rather technical backgrounds, the additional third scenario in Study 2 is embedded in an environmental sustainability. This enables an investigation of possible differences in results depending on the specific context in which the decision to explore or exploit takes place. The rationale is to cover for a variety of contexts in which the decision towards exploration/exploitation takes place. Second, in the experimental conditions of Study 2 directly compared a stable vs. a dynamic environment, i.e. without an additional control group without environmental framing to have an increased contrast on those conditions. This results in a two groups between-subjects experimental design. Third, in Study 1 the order of the vignettes was fixed. To exclude the possibility of order effects, the order of vignettes is randomized in Study 2 and the order of vignettes is included as control variable in the analysis (Auspurg and Jäckle 2017).

Study 2 was also conducted on Amazon Mechanical Turk. Workers who participated in Study 1 were excluded to rule out the possibility of non-naïveté among participants (Bentley 2017).

5.1 Participants and experimental scenario

The materials were similar to those used in Study 1, except that Study 2 has an additional scenario. Each participant was offered a reward of USD 2.50 for their participation – USD 0.50 more than in Study 1 to compensate for the additional third scenario. Participants were confronted with three scenarios in which they were asked to be a manager in a company, responsible for innovation (inspired by Ahmadi et al. 2017). As the two scenarios from Study 1 are

embedded in a technical context – involving digital payment systems and streaming solutions – the third scenario is concerned with sustainable innovation. More specifically, participants are asked to set themselves in the position of an innovation manager of a company that processes plastic waste and the manager instructed to find a solution for micro plastic. Again, after appropriate research, there are two viable solutions possible – one with explorative features and one with exploitative features.

In total, 155 workers completed the questionnaire. Examination of the attention check[5] revealed that 38 participants did not read the scenarios and therefore, their questionnaires were excluded from further analysis. This led to a final sample size of $n = 117$ participants in Study 2.

Study 2 was conducted without a control group. Thus, the experimental design of Study 2 is a 2x2 between-subjects design. To control for possible order effects, the order of the three experimental scenarios was randomized between participants and the sequence in which scenarios were shown is included as a control variable in the analysis. Besides that, the dependent and independent variables were measured as in Study 1.

Manipulation checks. Participants were asked to rate the perceived environmental dynamism in the scenarios after the dependent variable had been measured. To test whether the manipulation in the scenarios was successful, I tested if the means of the perceived environmental dynamism were different from each other in the three experimental groups. The means and t-values for the three scenarios of Study 2 are reported in Table D-7. The results show that for all three scenarios, the perceived environmental dynamism is significantly higher in the "Dynamic" group in comparison to the "Stable" group. In Study 1, one manipulation check failed to demonstrate significant differences between the experimental groups while results of Study 2 demonstrate a significant difference between all experimental groups. The scenarios remained

[5] Procedure and execution of attention-checks are the same as in Study 1.

unchanged compared to Study 1, however, in Study 1 the order of scenarios remained constant while in Study 2 the order of scenarios was randomized. As only one factor changed compared to Study 1 and it was the latter scenario of Study 1 that failed to demonstrate a significant manipulation check, I assume that survey fatigue has deployed and might have biased results of the manipulation check of the second scenario of study (Savage and Waldman 2008).

Table D-7: Mean comparison of perceived environmental dynamism in the three scenarios of Study 2

Variables	N	Mean	Standard Deviation	*t*-test for equality of means
Perc. Dynamism (Scenario 1)				
Dynamic Group	60	5,54	1,10	6,42***
Stable Group	57	3,84	1,69	
Perc. Dynamism (Scenario 2)				
Dynamic Group	60	5,18	1,04	5,59***
Stable Group	57	3,70	1,72	
Perc. Dynamism (Scenario 3)				
Dynamic Group	60	5,40	1,19	5,45***
Stable Group	57	3,98	1,59	

5.2 Analysis and results

Descriptive statistics. Table D-8 shows means and standard deviations of the study variables and correlations among the different constructs. Similarly to Study 1, individuals in the sample tend to prefer exploitation over exploration with a significantly higher mean value for exploitation than exploration in the three scenarios (Scenario 1: 5.15 vs 4.12, $p < 0.01$; Scenario 2: 4.85 vs 4.2, $p < 0.1$; Scenario 3: 5.08 vs 3.96, $p < 0.01$). Correlations between exploration and exploitation is negative and significant for scenario 1 and scenario 2. For scenario 3, the correlation between exploration and exploitation is negative but not on a significant level.

Table D-8: Descriptive statistics and correlations for Study 2

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1	Exploration (1)	4.12	2.07									
2	Exploitation (1)	5.15	1.73	-.75**								
3	Exploration (2)	4.22	2.01	.46**	-.27**							
4	Exploitation (2)	4.85	1.86	-.23*	.36**	-.65**						
5	Exploration (3)	3.96	2.01	.42**	-.09	.36**	-.13					
6	Exploitation (3)	5.08	1.73	-.26**	.23*	-.10	.20*	-.69**				
7	Present Focus	5.13	.99	.07	.00	.09	.04	.05	.17			
8	Future Focus	4.92	1.05	.12	-.02	.08	.11	.05	.18	.24**		
9	Environmental Dynamism	.51	.50	-.18	.16	.07	-.07	.02	-.05	-.08	-.16	
10	Risk Propensity	4.00	1.57	.40**	-.32**	.19*	-.19*	.32**	-.27**	-.06	.03	-.06

* $p < 0.05$, ** $p < 0.01$ (two tailed).

Hypotheses testing. Table D-9 - Table D-14 show the results of OLS regression analyses for the two types of innovation exploitation and exploration in Study 2. Analogously to Study 1, results of Study 2 for each scenario are displayed in four different models. The results for scenario 1 (Payment Systems) are shown in Table D-9 (exploration) and Table D-10 (exploitation), for scenario 2 (Micro Plastic) in Table D-11 (exploration) and Table D-12 (exploitation), and for scenario 3 (Streaming Services) in Table D-13 (exploration) and Table D-14 (exploitation), respectively. Model 1 tests effects of the control variables *Age*, *Education*, *Employment*, *Order*, and *Risk Propensity,* while Model 2 tests the direct effects of the independent variable *Temporal Focus*. In Model 3, the moderating variable *Environmental Dynamism* is captured, and interaction effects of the independent variable and the moderating variable are tested in Model 4.

In my tests of Hypotheses 1 to 4, results of Study 2 cannot confirm the proposed direct relationships between temporal focus and the two forms of innovation, exploration and exploitation. Results show that the negative relation between a present focus and exploration as suggested in Hypothesis 1 could not be confirmed (B = 0.18, $p > 0.05$ for scenario 1; B = 0.14, $p > 0.05$ for scenario 2; B = 0.15, $p > 0.05$ for scenario 3). In Hypothesis 2, the suggested positive relationship of a present focus and exploitation could not be confirmed by the data either

(B = - 0.04, $p > 0.05$ for scenario 1; B = 0.05, $p > 0.05$ for scenario 2; B = 0.17, $p > 0.05$ for scenario 3). Hypotheses 3 suggested a positive association of a future focus and exploration. However, there is no evidence which supports this in the data (B = 0.16, $p > 0.05$ for scenario 1; B = 0.10, $p > 0.05$ for scenario 2; B = 0.04, $p > 0.05$ for scenario 3). Hypothesis 4, which assumed a negative association between a future focus and exploitation, could not be confirmed (B = 0.01, $p > 0.05$ for scenario 1; B = 0.19, $p > 0.05$ for scenario 2; B = 0.24, $p > 0.05$ for scenario 3).

Hypothesis 5 and 6 suggested that dynamic environments strengthen the negative relationship of a present focused and exploration (H5) and the positive relationship between a present focus and exploitation (H6). The interaction terms of present focus and environmental dynamism were statistically non-significant for all three scenarios regarding both dependent variables: exploration (B = -0.13, $p > 0.05$ for scenario 1; B = 0.20, $p > 0.05$ for scenario 2; B = -0.06, $p > 0.05$ for scenario 3) and exploitation (B = -0.01, $p > 0.05$ for scenario 1; B = -0.16, $p > 0.05$ for scenario 2; B = -0.09, $p > 0.05$ for scenario 3). Hence, the data in Study 2 neither supports H5 & H6.

Hypotheses 6 and 7 proposed that a dynamic environment will strengthen the positive association of a future with exploration (H7) and the negative association with exploitation (H8). There is no evidence that supports these hypotheses[6]. Interaction terms of future focus and environmental dynamism are non-significant regarding exploration for scenario 1 and scenario 3 (B = 0.16, $p > 0.05$ for scenario 1; B = -0.09, $p > 0.05$ for scenario 3) and exploitation (B = 0.11, $p > 0.05$ for scenario 1; B = -0.18, $p > 0.05$ for scenario 3). The interaction term for scenario 2 regarding exploration is significant (B = -0.94, $p < 0.05$) and regarding exploitation it is on a 10% significance level (B = 0.61, $p = 0.09$). However, as signs of the interaction coefficients

[6] I further tested our hypotheses by using the data obtained from manipulation checks as the moderating explanatory variable (Kotzian et al. 2015; Hauser et al. 2018), however, results did not change.

show, the moderation effects go in opposing directions as hypothesized. Further analysis of conditional effects (Kingsley et al. 2017; Hayes 2017b) revealed that in Scenario 2 moderation of environmental dynamism regarding exploration occurs only in the "low dynamism" assignment (r = 0.06, p < 0.05) while the conditional effect of high dynamism is non-significant (r = - 0.33, p > 0.05). This means for this case that individuals tend to prefer exploration when environments are stable. For exploitation, here is the moderation effect of high dynamism for the future focus-exploitation relationship significant on 10% significance level (r = 0.46, p = 0.06) while it is non-significant for the low dynamism condition (r = -0.15, p > 0.05). The moderation in Scenario 2 is depicted in Figure D-2.

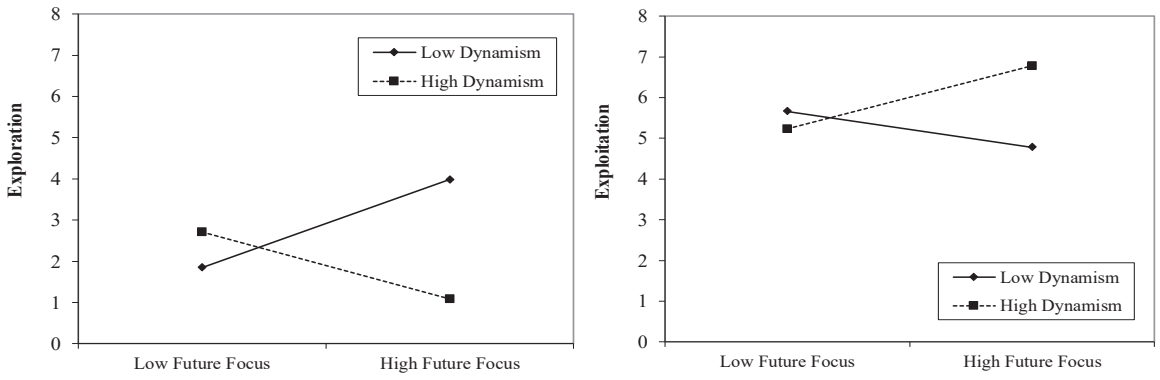

Figure D-2: Interaction plots for future focus, environmental dynamism, and explorative/ exploitative innovation (Scenario 2, Study 1)

Table D-9: OLS regression analyses: Results for exploration (Scenario 1, Study 2)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploration (Scenario 1)								
Control								
Age	-0.01	0.02	-0.01	0.02	-0.01	0.02	-0.01	0.02
Education	0.01	0.14	0.01	0.14	0.05	0.14	0.07	0.14
Employment	0.11	0.14	0.13	0.14	0.11	0.14	0.11	0.14
Order	0.02	0.11	0.00	0.11	-0.06	0.11	-0.06	0.11
Risk Propensity	0.52***	0.12	0.53***	0.12	0.54***	0.12	0.53***	0.12
Main effects								
Present Focus			0.18	0.19	0.16	0.19	0.23	0.27
Future Focus			0.16	0.18	0.12	0.18	0.03	0.26
Environmental Dynamism					-0.67*	0.38	-0.79	2.33
Interaction effect								
Present Focus x Environmental Dynamism							-0.13	0.37
Future Focus x Environmental Dynamism							0.16	0.37
R^2		0.18		0.20		0.22		0.22
ΔR^2				0.02		0.02		0.00
R^2 *Adj.*		0.15		0.15		0.16		0.15
ΔR^2 Adj.				0.00		0.02		-0.01
F Change				1.10		3.14*		0.13

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; N=117

Table D-10: OLS regression analyses: Results for exploitation (Scenario 1, Study 2)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploitation (Scenario 1)								
Control								
Age	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.02
Education	0.08	0.12	0.08	0.12	0.05	0.12	0.06	0.12
Employment	-0.04	0.12	-0.04	0.12	-0.03	0.12	-0.04	0.12
Order	-0.09	0.09	-0.08	0.10	-0.04	0.10	-0.04	0.10
Risk Propensity	-0.32***	0.10	-0.33***	0.11	-0.33***	0.11	-0.34***	0.11
Main effects								
Present Focus			-0.04	0.17	-0.03	0.17	-0.02	0.24
Future Focus			0.01	0.16	0.03	0.16	-0.02	0.23
Environmental Dynamism					0.45	0.34	-0.08	2.06
Interaction effect								
Present Focus x Environmental Dynamism							-0.01	0.33
Future Focus x Environmental Dynamism							0.11	0.33
R^2		0.12		0.12		0.13		0.13
ΔR^2				0.00		0.01		0.00
R^2 *Adj.*		0.08		0.06		0.07		0.05
ΔR^2 Adj.				-0.02		0.01		-0.02
F Change				0.03		1.82		0.06

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; N=117

Table D-11: OLS regression analyses: Results for exploration (Scenario 2, Study 2)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploration (Scenario 2)								
Control								
Age	-0.01	0.02	-0.01	0.02	-0.01	0.02	-0.01	0.02
Education	0.11	0.14	0.11	0.14	0.07	0.14	0.00	0.14
Employment	-0.09	0.14	-0.08	0.15	-0.07	0.15	-0.05	0.14
Order	0.09	0.11	0.08	0.11	0.13	0.12	0.14	0.12
Risk Propensity	0.25**	0.13	0.26**	0.13	0.25**	0.13	0.29**	0.13
Main effects								
Present Focus			0.14	0.20	0.15	0.20	0.03	0.28
Future Focus			0.10	0.19	0.13	0.19	0.61**	0.27
Environmental Dynamism					0.47	0.40	4.12*	2.39
Interaction effect								
Present Focus x Environmental Dynamism							0.20	0.39
Future Focus x Environmental Dynamism							-0.94**	0.38
R^2		0.06		0.07		0.08		0.13
ΔR^2				0.01		0.01		0.05
R^2 *Adj.*		0.02		0.01		0.01		0.05
ΔR^2 Adj.				-0.01		0.00		0.04
F Change				0.52		1.39		3.10**

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; N=117

Table D-12: OLS regression analyses: Results for exploitation (Scenario 2, Study 2)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploitation (Scenario 2)								
Control								
Age	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02
Education	0.04	0.13	0.04	0.13	0.07	0.13	0.12	0.14
Employment	0.09	0.13	0.09	0.13	0.08	0.13	0.07	0.13
Order	-0.12	0.10	-0.13	0.11	-0.17	0.11	-0.17	0.11
Risk Propensity	-0.23*	0.12	-0.22*	0.12	-0.21*	0.12	-0.24**	0.12
Main effects								
Present Focus			0.05	0.18	0.04	0.18	0.13	0.26
Future Focus			0.19	0.17	0.17	0.17	-0.15	0.25
Environmental Dynamism					-0.42	0.37	-2.61	2.25
Interaction effect								
Present Focus x Environmental Dynamism							-0.16	0.36
Future Focus x Environmental Dynamism							0.61*	0.36
R^2		0.06		0.07		0.08		0.11
ΔR^2				0.01		0.01		0.03
R^2 *Adj.*		0.01		0.01		0.01		0.02
ΔR^2 Adj.				0.00		0.00		0.01
F Change				0.74		1.25		1.47

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; N=117

Table D-13: OLS regression analyses: Results for exploration (Scenario 3, Study 2)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploration (Scenario 3)								
Control								
Age	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02
Education	-0.07	0.14	-0.07	0.14	-0.08	0.14	-0.09	0.15
Employment	-0.01	0.14	0.01	0.14	0.01	0.14	0.01	0.14
Order	-0.03	0.11	-0.04	0.11	-0.02	0.12	-0.02	0.12
Risk Propensity	0.40***	0.12	0.41***	0.12	0.41***	0.12	0.41***	0.13
Main effects								
Present Focus			0.15	0.19	0.15	0.20	0.18	0.28
Future Focus			0.04	0.18	0.05	0.19	0.10	0.27
Environmental Dynamism					0.20	0.40	0.95	2.43
Interaction effect								
Present Focus x Environmental Dynamism							-0.06	0.39
Future Focus x Environmental Dynamism							-0.09	0.38
R^2		0.11		0.11		0.12		0.12
ΔR^2				0.01		0.00		0.00
R^2 *Adj.*		0.07		0.06		0.05		0.03
ΔR^2 Adj.				-0.01		-0.01		-0.02
F Change				0.36		0.26		0.05

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; N=117

Table D-14: OLS regression analyses: Results for exploitation (Scenario 3, Study 2)

	Model 1		Model 2		Model 3		Model 4	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploitation (Scenario 3)								
Control								
Age	-0.02	0.01	-0.01	0.01	-0.01	0.01	-0.01	0.01
Education	0.04	0.12	0.04	0.12	0.04	0.12	0.03	0.12
Employment	-0.07	0.12	-0.06	0.12	-0.07	0.12	-0.06	0.12
Order	0.11	0.10	0.09	0.10	0.09	0.10	0.09	0.10
Risk Propensity	-0.34***	0.11	-0.32***	0.11	-0.32***	0.11	-0.31***	0.11
Main effects								
Present Focus			0.17	0.17	0.17	0.17	0.22	0.24
Future Focus			0.24	0.16	0.24	0.16	0.33	0.23
Environmental Dynamism					-0.01	0.34	1.35	2.05
Interaction effect								
Present Focus x Environmental Dynamism							-0.09	0.33
Future Focus x Environmental Dynamism							-0.18	0.33
R^2		0.10		0.14		0.14		0.14
ΔR^2				0.04		0.00		0.00
R^2 *Adj.*		0.06		0.08		0.07		0.06
ΔR^2 Adj.				0.02		-0.01		-0.01
F Change				0.36		0.26		0.05

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; N=117

6 Supplemental Analysis

In the main analysis, Model 1 shows that in Study 1 (Table D-3 - Table D-6) and Study 2 (Table D-9 - Table D-14) for both dependent variables – exploration and exploitation – the control variable risk propensity has statistically significant effects. Supplemental analysis reveals effects of an individual's risk-taking propensity as the sole estimator for the pursue of exploratory and exploitative innovation decisions. Results of OLS regression analyses for Study 1 and Study 2 are presented in Table D-16 – Table D-18. Results are reported for all scenarios in separate tables for exploration and exploitation, whereby the displayed coefficients and standard errors for control variables, main effects and interaction effects were computed in separated models. R^2, R^2 *Adjusted* and *F*-Values are reported for the model with interaction terms. In the data of Study 1, a significant main effect of risk-taking propensity on both dependent variables can be observed, whereby the effect is positive for exploration (B = 0.64, $p < 0.01$ for scenario 1; B = 0.63, $p < 0.01$ for scenario 2) and negative for exploitation (B = -0.52, $p < 0.01$ for scenario 1; B = -0.41, $p < 0.01$ for scenario 2). The same is true for the data in Study 2 – in all three scenarios, there is a positive main effect of risk-taking propensity on exploration (B = 0.50, $p < 0.01$ for scenario 1; B = 0.25, $p < 0.01$ for scenario 2; B = 0.39, $p < 0.01$ for scenario 3) and negative main effect on exploitation (B = -0.33, $p < 0.01$ for scenario 1; B = -0.24, $p < 0.05$ for scenario 2; B = -0.31, $p < 0.01$ for scenario 3).

For Study 1, directions of the interaction effects of risk-taking propensity and environmental dynamism can be observed through the dummy variables *D1* "low dynamism" and *D2* "high dynamism" (reference category is the group without an environmental framing). For exploration in Scenario 1 (Payment Systems), the interaction terms of risk-taking propensity and environmental dynamism are non-significant on a 5% level but on a 10% level (B = 0.49, $p < 0.10$ in the *high dynamism* condition; B = 0.45, $p < 0.10$ in the *low dynamism* condition). For

exploration in Scenario 2 (Streaming Services), the interaction terms are both significant on a 5% level (B = 0.73, $p < 0.05$ in the *high dynamism* condition; B = 0.95, $p < 0.01$ in the *low dynamism* condition). For exploitation in Scenario 1, the interaction term is negative and significant on a 10% level for the *high dynamism* condition (B = -0.45, $p < 0.01$) while it is above a 10% significance level for *low dynamism* (B = -0.24, $p > 0.10$). For exploitation in Scenario 2, both interaction terms *high dynamism* and *low dynamism* are significant on a 10% level. The interactions are graphically depicted in Figure D-3 for exploration and in Figure D-4 for exploitation. More risk prone individuals are higher on exploration in the high dynamic condition than in the low dynamic condition in both scenarios. For exploitation, the regression slopes do not show consistent moderating effects.

For Study 2, the interaction terms were non-significant for both dependent variables exploration (B = 0.20, $p > 0.05$ for scenario 1; B = 0.34, $p > 0.05$ for scenario 2; B = 0.32, $p > 0.05$ for scenario 3) and exploitation (B = 0.04, $p > 0.05$ for scenario 1; B = -0.11, $p > 0.05$ for scenario 2; B = -0.12, $p > 0.05$ for scenario 3). As there was no control group in Study 2, further analysis was conducted to explore conditional effects of the moderator (Kingsley et al. 2017; Hayes 2017b). Marginal effects of risk-taking propensity at values of the moderator environmental dynamism are displayed for exploration in Table D-19 and for exploitation in Table D-20. For exploration, there is for all three scenarios a significant positive marginal effects (*ME*) in the *high dynamism* condition (*ME* = 0.60, $p < 0.17$ for scenario 1; *ME* = 0.43, $p < 0.05$ for scenario 2; *ME* = 0.56, $p < 0.01$ for scenario 3). For exploitation, the marginal effects are negative in all three scenarios and are significant in Scenario 3 (*ME* = -0.37, $p < 0.05$), significant on a 10% level in Scenario 2 (*ME* = - 30, $p < 0.10$), and non-significant in Scenario 1 (*ME* = -0.31, $p > 0.10$). The interactions of Study 2 are graphically depicted in Figure D-5 for exploration and in Figure D-6 for exploitation. Consistent to results of Study 1, more risk prone individuals are higher on exploration in the high dynamic condition than in the low dynamic condition in

scenario 2 (Micro Plastic) and scenario 3 (Streaming Services). In scenario 1 (Payment Systems), the difference of a high and low dynamism conditions is smaller. Marginal effects of the moderation are only statistically significant (and positive) for the high dynamism condition in scenario 3 and scenario 3, the marginal effects for scenario 1 are statistically significant for both conditions. I do not expect major discrepancies however, as marginal effects in a high dynamism conditions are larger than those in a low dynamism condition. This is consistent to results of Study 1 and the other two scenarios of Study 2. For exploitation, the regression slopes of scenario 1 and scenario 3 have statistically significant negative marginal effects for the moderator. For exploitation, moderating effects do not show consistency similar to Study 1. While marginal effects of the moderator are negative in all scenarios, effects sizes of high and low dynamism condition vary between the scenarios. This leads to conclude that environmental dynamism plays an enhancing role for the positive relationship of risk-taking propensity and explorative innovation while it is not of major relevance for the negative relationship of risk-taking propensity and exploitative innovation.

Table D-15: Supplemental OLS regression analyses: Results for exploration (risk-taking propensity, Study 1)

	Scenario 1		Scenario 2	
Variables	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploration				
Control				
Age	-0.28	0.19	0.24	0.16
Education	0.12	0.20	-0.25	0.18
Employment	-0.14	0.15	0.00	0.13
Main effects				
Risk Propensity	0.64***	0.11	-0.52***	0.10
Environmental Dynamism (D1)	-0.04	0.39	0.14	0.35
Environmental Dynamism (D2)	0.06	0.40	-0.07	0.36
Interaction effect				
Risk Propensity x Environmental Dynamism (D1)	0.45*	0.25	-0.24	0.22
Risk Propensity x Environmental Dynamism (D2)	0.45*	0.25	-0.24	0.22
R^2		0.04		0.05
R^2 *Adj.*		0.01		0.02
F(6,110)		5.13***		4.51***

* p < 0.1, ** p < 0.05, *** p < 0.01; N=104

Table D-16: Supplemental OLS regression analyses: Results for exploitation (risk-taking propensity, Study 1)

	Scenario 1		Scenario 2	
Variables	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploitation				
Control				
Age	-0.39*	0.20	0.45**	0.18
Education	-0.15	0.22	0.07	0.19
Employment	0.08	0.16	-0.15	0.14
Main effects				
Risk Propensity	0.63***	0.13	-0.41***	0.12
Environmental Dynamism (D1)	0.02	0.43	0.57	0.40
Environmental Dynamism (D2)	-0.25	0.44	0.83**	0.41
Interaction effect				
Risk Propensity x Environmental Dynamism	0.96***	0.27	-0.50*	0.26
Risk Propensity x Environmental Dynamism	0.96***	0.27	-0.50*	0.26
R^2		0.04		0.07
R^2 *Adj.*		0.01		0.04
F(6,110)		5.95***		3.85***

* p < 0.1, ** p < 0.05, *** p < 0.01; N=104

Table D-17: Supplemental OLS regression analyses: Results for exploration (risk-taking propensity, Study 2)

	Scenario 1		Scenario 2		Scenario 3	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploration						
Control						
Age	-0.03	0.02	-0.01	0.02	0.00	0.02
Education	-0.13	0.14	0.09	0.14	-0.08	0.14
Employment	0.15	0.14	-0.10	0.14	0.00	0.14
Main effects						
Risk Propensity	0.50***	0.12	0.09	0.17	0.24	0.16
Environmental Dynamism	-0.61*	0.36	-1.06	1.02	-1.09	0.99
Interaction effect						
Risk Propensity x Environmental Dynamism	0.20	0.23	0.34	0.24	0.32	0.23
R^2		0.20		0.07		0.12
R^2 *Adj.*		0.15		0.02		0.07
F(6,110)		4.46***		1.43		2.56**

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; N=117

Table D-18: Supplemental OLS regression analyses: Results for exploitation (risk-taking propensity, Study 2)

	Scenario 1		Scenario 2		Scenario 3	
Variables	**B**	***SE***	**B**	***SE***	**B**	***SE***
Dependent Variable: Exploitation						
Control						
Age	0.01	0.01	0.00	0.02	-0.01	0.01
Education	0.16	0.12	0.09	0.13	0.13	0.12
Employment	-0.06	0.12	0.08	0.13	-0.10	0.12
Main effects						
Risk Propensity	-0.33***	0.10	-0.24**	0.11	-0.31***	0.10
Environmental Dynamism	0.46	0.31	-0.32	0.35	-0.24	0.32
Interaction effect						
Risk Propensity x Environmental Dynamism	0.04	0.20	-0.11	0.22	-0.12	0.20
R^2		0.13		0.06		0.10
R^2 *Adj.*		0.08		0.00		0.05
F(6,110)		2.64**		1.07		1.96*

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; N=117

Table D-19: Marginal effects of risk-taking propensity on exploration (Study 2)

	Scenario 1		Scenario 2		Scenario 3	
Moderating Variable	**Effect**	***SE***	**Effect**	***SE***	**Effect**	***SE***
Dependent Variable: Exploration						
Interaction effect						
Environmental Dynamism = 0	0.40**	0.20	0.09	0.21	0.24	0.22
Environmental Dynamism = 1	0.60***	0.17	0.43**	0.18	.56***	0.15

* $p < 0.1$, ** $p < 0.05$, *** p < 0.01; N=117

Table D-20: Marginal effects of risk-taking propensity on exploitation (Study 2)

	Scenario 1		Scenario 2		Scenario 3	
Moderating Variable	**Effect**	***SE***	**Effect**	***SE***	**Effect**	***SE***
Dependent Variable: Exploitation						
Interaction effect						
Environmental Dynamism = 0	-0.35**	0.18	-0.19	0.15	-0.25*	0.15
Environmental Dynamism = 1	-0.31*	0.16	-0.30	0.20	-0.37**	0.15

* $p < 0.1$, ** $p < 0.05$, *** p < 0.01; N=117

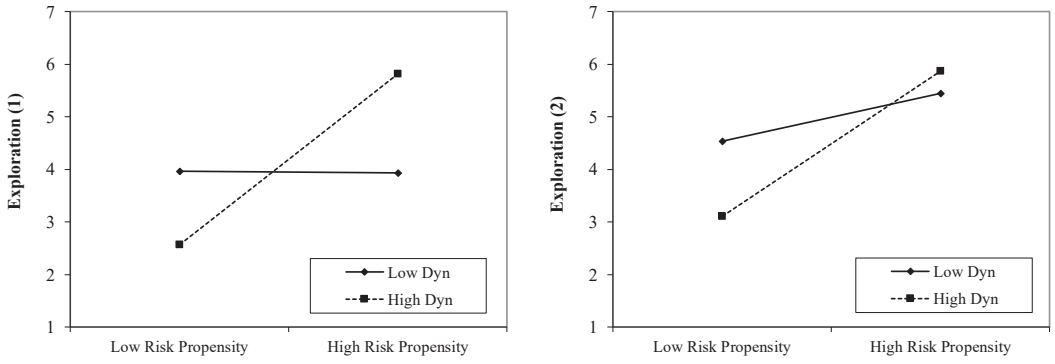

Figure D-3: Supplemental analysis: Interaction plots for risk-taking propensity, environmental dynamism, and explorative innovation (Study 1)

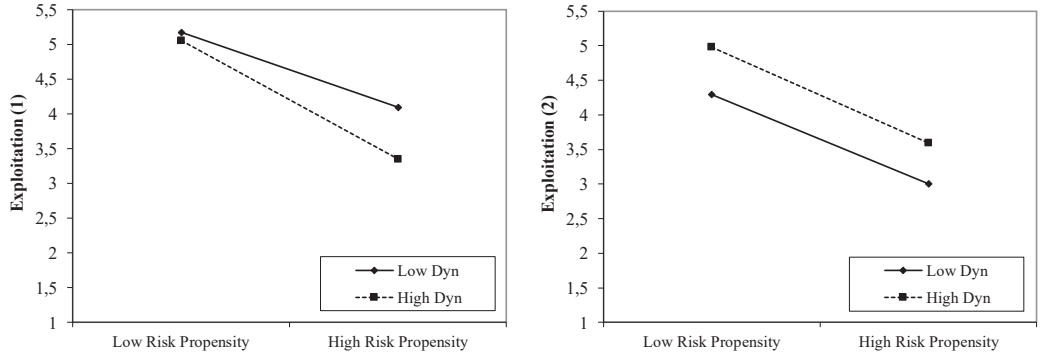

Figure D-4: Supplemental analysis: Interaction plots for risk-taking propensity, environmental dynamism, and exploitative innovation (Study 1)

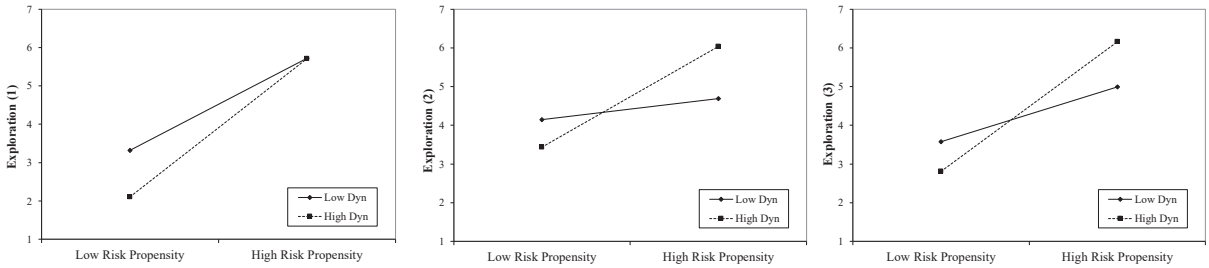

Figure D-5: Supplemental analysis: Interaction plots for risk-taking propensity, environmental dynamism, and explorative innovation (Study 2)

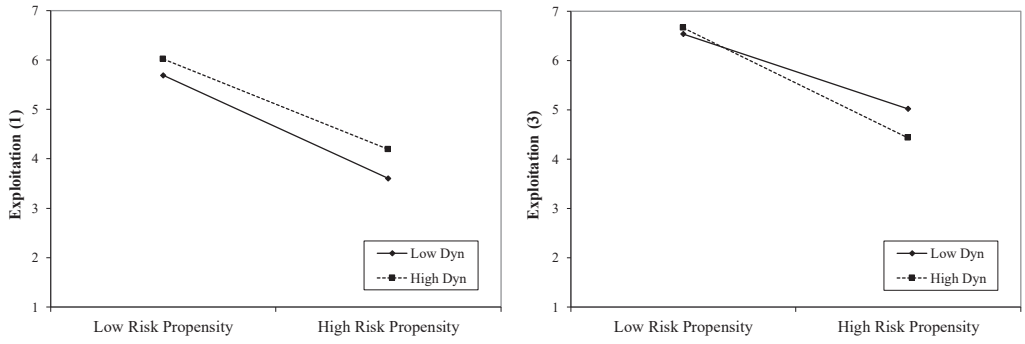

Figure D-6: Supplemental analysis: Interaction plots for risk-taking propensity, environmental dynamism, and exploitative innovation (Study 2)

7 Discussion

This study has drawn upon the psychological concept of temporal focus (Bluedorn 2002; Shipp et al. 2009; Zimbardo and Boyd 1999) and examined how the temporal focus of individuals can serve as an attentional filter in determining how it relates to preferences of explorative or exploitative innovation activities. Therewith, I heed to calls of former research that empirical studies are needed to examine the relationship of temporal foci (i.e. a present and future focus) and its influence on exploitation and exploration strategies (Brigham et al. 2014). Further, it was proposed that environmental conditions can moderate the impact of temporal focus. To test this influence, I manipulated the environmental context in two vignettes to create a dynamic and a stable environmental context.

The aim of the study was to extent prior findings of temporal focus and innovation so that strategy scholars might be able to build up on a more nuanced understanding of temporal considerations based on characteristics of individuals. However, the theoretically derived framework was not supported in this study. The data shows that individuals vary in the degree they characteristically devote attention to the present or future but that these differences do not explain additional variance in decisions concerning exploitative and exploratory innovation. Without control variables, there is partial support for *H3* and *H4*, i.e. that a future focus is positively associated with exploration and negatively associated with exploitation (for scenario 1: $B = 0.31$, $p < 0.01$ for exploration and $B = -0.17$, $p > 0.05$ for exploitation; for scenario 2, respectively: $B = 0.40$, $p < 0.01$ for exploration and $B = -0.36$, $p < 0.01$ for exploitation). When including *risk-taking propensity*, these statistically significant results of a future focus do not hold anymore, however. In fact, it becomes obvious that risk-taking propensity is the best estimator of the study variables to explain decisions towards exploratory and exploitative innovation. Namely, a higher risk-taking propensity is associated with exploration and a lower risk-

taking propensity is associated with exploitation (for scenario 1: $B = 0.54$, $p < 0.001$ for exploration and $B = -0.48$, $p < 0.001$ for exploitation; for scenario 2, respectively: $B = 0.60$, $p < 0.001$ for exploration and $B = -0.34$ $p < 0.001$ for exploitation). Hence, I find no evidence for the proposed hypotheses *H1 – H4,* that a present focus or a future focus leads to the pursue of more exploration or exploitation. Furthermore, there is no support for Hypothesis 5-8, i.e. an interaction of temporal focus with high dynamism concerning preferences for exploration and exploitation. Therefore, *H5-H8* are rejected after the analysis.

This study's findings cannot confirm previous findings of e.g. Prinz et al. (2019), Nadkarni and Chen (2014) and Yadav et al. (2007) that individual's temporal focus influences innovation decisions. There are several explanations for those differences in findings. First, my sample is very different to most of the samples in previous research. While prior studies examined responsible individuals in a real-life setting where their decisions were actual ones, this study used hypothetical scenarios. This imposed artificial setting may suppresses many factors leading to a decision in real-life. Particularly, as Amazon Mechanical Turk workers may be unrepresentative of educated and trained executives or high-level innovation managers in companies (Huff and Tingley 2015). Although I included employment status and job experience as control variables and results did not change, the population of Amazon Mechanical Turk workers is very heterogenous (Bentley 2017) and my sample size is not large enough to adequately examine differences related to employment status and job experience in a particular industry. However, this study's objective was to examine whether stable individual differences in temporal focus explain variance in exploration/exploitation decisions in general and not only for a certain sub-group such as executives or trained innovation managers. While one's temporal focus is primarily formed in the early childhood and should be stable over time, it "could be reinforced or modified through additional socialization experiences such as education, occupational choice, or personal experiences" (Shipp et al. 2009, p. 2). Experienced managers and executives

who work for many years in their jobs and are confronted with innovation decisions on a regular basis might have reinforced or adapted their temporal focus to their domain over time. This may be a reason why findings between sub-populations differ to a large degree. If this was the case, however, then the temporal focus variable would not be independent anymore.

Secondly, prior studies did not give attention to an individual's risk-taking propensity. This is surprising as already March (1991) hinted that risk-taking propensity can be a main driver for the pursuit of exploration and exploitation. Risk-prone individuals may be more inclined towards exploration while risk-averse managers may reinforce exploitation as returns are expected to be more proximate and certain (March 1991; Lavie et al. 2010). This argument is supported by the results of this study. As stated above, without control variables, there is partial support for associations between a future focus and exploration/exploitation. However, as soon as r*isk-taking propensity* is added as a control into the models, all significant effects of temporal focus on exploration and exploitation disappear. On the one hand, exploration has an inherent risk component and thus, processes and decisions to allocate resources between exploration and exploitation, therefore, embody risk preferences (March 1991, p. 71). However, to the best of my knowledge, there is no empirical study on exploration/exploitation which tested the influence of risk-taking propensity. On the other hand, the aim of this research was to study relationships between individual's characteristics, i.e. temporal focus on exploration/exploitation and that needs to be shown while holding other traits such as risk-taking propensity constant to ensure that the examined traits explain additional variance. Risk-taking propensity is significantly positively correlated with exploration and significantly negatively correlated with exploitation (see Table D-2 and Table D-8) which already hints to the results of the supplemental analysis. In research a link between risk-taking propensity and innovative behavior has been identified in several studies (e.g. March 1996). Specifically, higher risk-taking propensity is linked to higher innovative results (Ling et al. 2008), which speaks for the results that risk-

taking propensity is strongly positively associated with explorative and negatively with exploitative innovation. A high risk-taking propensity ensures that individuals see less the risks of a highly innovative decision than the potential opportunities and outcomes that can result from risky decisions under greater uncertainty (Ling et al. 2008; Wu 2008). This aspect also supports the view that a high risk-taking propensity is more likely to be accompanied by explorative innovations. Research also shows that a high risk-taking propensity leads to uncertainty being accepted in decision-making. As a result, more out-of-the-box approaches to innovation are pursued and more innovative solutions are preferred (García-Granero et al. 2015). This also leads to more explorative innovations if the risk-taking propensity is correspondingly high. Prior research also found that individuals high in risk-taking propensity can encourage creative solutions and the challenge and change of an existing status-quo (García-Granero et al. 2015; Zhou and George 2001). This in turn further strengthens the theoretical finding of this study, that risk-taking propensity leads to more radical, explorative innovation.

Regarding an association of risk-taking and temporal focus, this study is mainly in line with prior findings; risk-taking propensity is positively correlated with a present focus (r = 0.13; $p > 0.05$ and r = -0.06; $p > 0.05$ for Study 2) and positively correlated to a future focus (r = 0.25; $p < 0.05$ for Study 1 and r = 0.03; $p > 0.05$ for Study 2). I expected a present focus to be stronger correlated to risk-taking propensity than a future focus, as prior scholars found a present focus to be significantly more correlated to risky driving behavior (Zimbardo et al. 1997), substance abuse (Apostolidis et al. 2006) and general risk taking behavior (Jochemczyk et al. 2017). However, correlation coefficients between temporal focus and risk-taking propensity are relatively low and inconsistent between the two Studies of this paper. Hence, I do not expect that the constructs are associated to another. Furthermore, these results deviate only slightly from research specifically examining correlations between the temporal focus construct and

risk-taking propensity (Shipp et al. 2009) that also suggest no association between temporal focus and risk-taking propensity.

Third, the lacking moderating influence of environmental dynamism can have several reasons and implications. While concerns regarding the operationalization of the environmental manipulation are discussed in the following section, I address the issues here that the theoretical derivation yielded towards a reinforcement effect of a dynamic environment of the association between temporal focus and exploration/exploitation. This association was absent, however. In a supplemental analysis, I tested a moderation model without temporal focus – instead with risk-taking propensity as the main independent variable and environmental dynamism as moderator. This resulted in significant interaction terms for risk-taking propensity and dynamism. This leads me to conclude that risk-taking propensity is a more appropriate explanatory variable to explain people's preference towards exploitative and explorative innovation than temporal focus is. In summary, the analysis could not reveal evidence in the data for the hypothesized relationships. Hence, I cannot confirm that an individual's temporal focus is associated with exploratory and exploitative innovation or that there is an interaction with environmental dynamism.

8 Limitations and Future Research

This study's findings and limitations both offer promising opportunities for future research. First to mention are challenges in conjunction with data gathering on the online platform Amazon Mechanical Turk. Online research platforms such as Amazon Mechanical Turk are gaining increasingly popularity as a source for experimental subjects and this brings several limitations with it. For instance, while in a laboratory experiment it is possible to control for many variables that could influence results, on Amazon Mechanical Turk many things cannot be controlled for

(Bentley 2017). More concretely, it is impossible for a researcher to observe whether participants are doing other activities on the side while randomly clicking through a questionnaire. Some respondents may only participate "for quick cash rather than inherent interest, and may not be inclined to answer conscientiously" (Downs et al. 2010, p. 2402). Thus, they will not give their answers a great level of attention. The implemented instructional manipulation check for the vignettes showed that respondents in the experimental conditions perceived the environment significantly different from each other in all scenarios of both studies, except scenario 2 (Streaming Services) of Study 1. The same scenario was used in Study 2, for which the instructional manipulation check showed significantly different results (see Table D-7). This leads me to conclude that the non-significance of perceived environmental dynamism in scenario 2 of Study 1 is due to a random error. Although it is unlikely that fatigue came to pass in Study 1 (mean time = 9.21 minutes) as Study 2 had one scenario more (mean time = 13.08 minutes), it cannot be ruled out that participants were less attentive regarding their answers. This might be particularly the case for item batteries, i.e. that the clicked through them without really reading or thinking about the content. Especially, since I had only experienced workers with an approval rate >95% on Amazon Mechanical Turk, they may know when to pay attention and when not in order to get accepted and paid. Thus, it would be valuable to conduct similar studies in a laboratory or paper-pencil based setting to exclude any distortions of Amazon Mechanical Turk in comparison to other settings. Furthermore, the use of a very heterogenous population as those of Amazon Mechanical Turk may prevent the generalizability of my results to managers and executives leading companies. As argued above, many years of working experience might lead to an adaption or modification of temporal focus in managers or executives (Shipp et al. 2009). If that was the case, this would in turn question the theorized causal relationship of an influence of temporal focus on innovation as it may be possible that many years of working on innovative solutions could have altered manager's temporal focus through socialization in this field. Thus,

more research is required on the stability of temporal focus in general as well as how and over what timespan one's temporal focus can be altered. Furthermore, it would be particularly interesting to examine differences in the relationship of temporal to innovation decisions between trained managers or executives against non-managers in a controlled setting.

Secondly, to the best of my knowledge there are no studies on exploration and exploitation which include risk-taking propensity as predictor or control variable. While prior studies often suggest that a high risk-taking propensity drives to exploration while risk aversion leads to exploitation (Lavie et al. 2010, e.g.; Ahmadi et al. 2017), they do not explicitly control for risk-taking propensity. Given the strong explanatory power in my results I highly recommend including risk-taking propensity in future studies that examine individual antecedents of explorative and exploitative innovation.

Third, a limitation could be concerned with the conceptualization of the vignettes and the manipulation of environmental dynamism. Human behavior is sensitive to many factors that differ between artificial vignette settings and the real-world which may influence decision outcomes (Levitt and List 2007). To manipulate dynamism in the vignettes, I used an adapted version of a questionnaire from Jansen et al. (2009). However, a created artificial scenario is very different to naturally occurring environments in which choice sets and possibilities are almost limitless. These restrictions have been shown to affect decisions and behavior (Levitt and List 2007; Lazear et al. 2006). Furthermore, the question arises to what extent a dynamic environment can really be imposed in individuals and to what extent participants would be affected in their decisions similarly to dynamism in the real world as whatever occurs in the external environment affects the degree of perceived uncertainty of the decision maker. In themselves, environments are neither certain nor uncertain but rather are perceived differently by different individuals and organizations (Achrol and Stern 1988, p. 37; Achrol et al. 1983). As a result of increased uncertainty, organizations and its individuals are required to respond more rapidly to unpredicted

changes in order to survive which makes the decision-making process more challenging and complex (Wallace et al. 2010; Barr et al. 1992; Dess and Beard 1984). Although for most of the scenarios, there was a significant difference in the instructional manipulation check, i.e. participants perceived the scenario in a different environmental context, we do not yet know to what extent environmental dynamism is inducible through vignettes and whether it is comparable to dynamism as experienced in managers in companies. Thus, it would be beneficial for future research to study if and to what degree environmental conditions can be induced in an experimental setting.

Moreover, dynamism represents only one aspect of the environment and to further investigate the moderating influence of the environmental factors, additional dimensions should be considered. Besides a broader perspective of environmental dimensions, a deeper investigation of environmental dynamism could also be a promising avenue. Levinthal and Posen (2008) found in experimental studies with simulated data that when dynamism leads to a better and more munificent environment than exploration is best strategy. However, when a dynamic environment makes the environment less attractive and less munificent than an exploitation strategy is by far the better way. These findings have to be considered with care as simulated data was used instead of real-world data, but these findings may have an impact on how participants evaluated the scenario and thus, on the results of this study. Depending on how participants associated a more dynamic environment with a better and more munificent world this could have affected their decision in relation to an explorative or exploitative innovation strategy. Future research should therefore include environmental munificence as a study variable to control for such an influence.

Lastly, I encourage researchers to employ more experimental investigations regarding individual antecedents of exploration and exploitation. While this method has its drawbacks like any other method, “[an experimental] approach has—in marked contrast to all other methods—the

advantages of yielding evidence from counterfactual situations and a strong control of the setting" (Brüggemann and Bizer 2016, p. 11).

E Concluding Remarks

1 Core Results and Contribution

Behavioral decision-making constitutes a key theme for entrepreneurship and management and is a complex research issue. Decisions that have to be made within the framework of entrepreneurship and management in every company include fundamentally important choices such as what kind of innovation should be further applied in the entrepreneurial or managerial context in order to ensure the success of the company. Entrepreneurs and managers are faced with the question of whether they prefer to explore radically new innovations or whether they exploit incrementally change existing products or services (March 1991; Jansen et al. 2009; Benner and Tushman 2003). If previous strategies of the founder have failed, the topic of entrepreneurial failure becomes relevant. The focus here is also on decisions as to how founders can proceed further and how they deal with the situation of failure (Jenkins and McKelvie 2016; Jenkins and Davidsson 2015). The decisions made play a decisive role in determining whether or not a founder is starting a new business. The present dissertation contributes to developing a more comprehensive understanding on the decisions in the context of entrepreneurial failure and managerial innovation decisions. Moreover, the dissertation deduces implications that may pave the way for future scholars and that may prove beneficial to future entrepreneurs and managers in international companies.

The first study contributes to the entrepreneurship, psychological and behavioral literature by examining the impact of failure on future entrepreneurship. Implications of the research

conducted in this dissertation suggest psychological mechanisms that explain re-enter intentions post failure. The study analyses which cognitive factors influence the decision to start a new business after first time entrepreneurs have failed with their venture and illustrates implication in terms of when it is likely that those failed entrepreneurs have learned from past mistakes. It is argued that the interpretation of causes of the failure – namely, the attributional style (Peterson et al. 1982; Seligman 1991) – play a substantial influencing role. In line with prior literature failure (Askim & Feinberg, 2001; Cardon & McGrath, 1999; Shaver et al., 2001), the study distinguishes between two dimensions of one's attributional style: (1) locus of causality and (2) stability and proposes that combinations of those dimensions of the attributional style will lead to diverging reactions for a similarly perceived failure event. It is deduced conceptually that a helplessness or victim-of-circumstances condition may hinder an entrepreneurial re-entry as those combinations will amplify the negative effect of the costs of failure on subsequent perceptions of feasibility and desirability to re-enter. Contrary, entrepreneurs in a mastery condition and the self-serving condition show a different picture. Persons with these conditions will discount previously experienced costs of failure, which in turn will increase feasibility and desirability perceptions of a re-enter and finally re-enter intentions. Furthermore, the study suggests that an entrepreneur's attributional style influences not only the formation of re-enter intentions but has also implication for future entrepreneurship, i.e. when a new venture is started post failure. While a helplessness and a victim-of-circumstances condition may to hinder a re-entry, a mastery reaction and a self-serving condition appear to be steppingstones into serial entrepreneurship. Entrepreneurs in the mastery condition are most likely to have learned the most out of a failure and therefore, are more likely to be successful in subsequent entrepreneurial activities. In the case of entrepreneurs in the self-serving condition. Even if people who are subject to this condition are more likely to start a new business, after a failure experience these people are less willing to learn or reflect their mistakes than entrepreneurs in other conditions.

Due to the lower learning effects for entrepreneurs from the self-serving condition, it is more likely that even if they start a new business, the new start-up is less promising because they have not learned enough from their mistakes from the first start-up. Founders from the mastery condition are assumed to have a higher probability to find a new company and to lead this business to success.

The second study has revealed that strategic decisions can be influenced in particular by the aspect of temporal focus, so that it is also likely that temporal focus plays a decisive role in various decision-making processes in entrepreneurship and management. Since study 2 was based on data from CEOs and members of the top management level of 150 Dutch SMEs, the second study was able to show well the connections between the temporal focus and the type of innovation being pursued and the decision as to which innovation to choose.

The results illustrate that the temporal focus of the decision-maker in charge has an influence on the generative thinking of the individual and influences the form of the chosen innovation, i.e. explorative or exploitative innovation. In particular, it was shown that temporal focus has a direct influence on explorative innovation, but that exploitative innovation is contingent on external circumstances, which is here environmental dynamism. Accordingly, this dissertation also contributes to a better understanding of the moderating effect of a dynamic environment on the choice of a particular innovation. This study validates previous research approaches that found associates between CEOs temporal focus and general innovation outcomes of firms (Nadkarni and Chen 2014; Yadav et al. 2007) and extends those findings by differentiating the different innovation forms exploration and exploitation.

Study 3 takes up these results regarding the influence of temporal focus on the innovation decisions of CEOs and top-level managers and critically questions these results in the context of a further study. The links of Study 2 are tested in a survey experiment and it is tested whether

the influence of temporal focus on the different forms of innovation is systematically present. Therefore, it extends the previous approaches by connecting criteria and influencing factors with a different sample and method. Based on a sample of 117 completed surveys provided via Amazon Mechanical Turk, new findings on the influence of temporal focus in decision-making were obtained, particularly on how individuals who do not necessarily belong to the management team or "upper echelon" are influenced by temporal focus in their actions.

It turned out that the findings from study two could not be replicated with participants from the Amazon Mechanical Turk population in an experimental setting, so that statements about individuals at the management level cannot simply be transferred to the general population and broad mass of entrepreneurs and employees. In addition, results of two experimental studies showed that there are other influencing factors that have an effect on the innovation decision. Specifically, risk-taking propensity played a decisive role here. This dissertation enriches research with the statement that risk-taking propensity has an influence on the chosen form of innovation. Although the importance of risk-taking was mentioned the seminal study on explorative and exploitative innovation from March (1991), there is to the best of my knowledge surprisingly no study so far examining the empirical link of an individual's risk-propensity on explorative and exploitative innovation. The results of the two experimental studies in this dissertation showed that this link is prevalent. More precisely, the higher the risk-taking propensity of the respondents, the more explorative innovation tended to be preferred. On the contrary, the lower the risk-taking propensity of the participants, the more they tended towards exploitative innovation. Moreover, there was a moderating effect of the external environment, that the link between risk-taking propensity and the two forms of innovation is strengthens through a dynamic environment.

2 Future Research Implications

Based on the research – conceptual and empirical studies – conducted in each of the three studies, this dissertation sheds light on various aspect relating to entrepreneurial and managerial decision-making. This findings and limitations in this dissertation both offer promising opportunities for future research.

Study one showed that the perceived costs of failure, how people deal with the post-failure situation and how they fit into conditions such as the mastery condition or the self-serving condition can have an impact on the re-establishment of a company and the probability of success of a new business. Future research on the results and implications of this study should validate the theoretically derived framework and test the propositions empirically. For this purpose, operationalization approaches should first be developed, which should serve as a basis for the examination of the theoretical model. In addition, further implications for action should be derived after the operationalization and verification of the theoretical model. Further research should be conducted on how the perceived costs of failure can be influenced and, for example, how to prevent founders from simply not starting a new business after the failure of their own company due to a negative attitude towards the situation and their environment. Instead, research approaches and implications should be developed on how the perceived costs of failure can be influenced in such a way that positive self-reflection and positive learning effects can occur and founders are less guided by their emotions after the failure than by their critical questioning of the situation, trying to learn from their mistakes and minimizing the blockade on refounding. Research should also examine how conditions, such as the self-serving condition, can be influenced in such a way that the negative effects of the condition are reduced. For example, approaches should be developed on how people in the self-serving condition can develop learning effects and reflection processes to help these people to pave the way for a new business

start-up. The first study has shown in particular that the probability of re-entering the market and setting up a new business often depends on emotionally driven processes and the perceived costs of failure, thus research approaches have to be developed that enable early countermeasures in entrepreneurship processes to help founders to reflect better on what they are doing and if they should start a business one more time and what actions they need to take in order to successfully establish themselves in the market.

Study two focused on another important topic in the field of entrepreneurship and management. Study two dealt with the question how a temporal focus affects the innovation decision of an individual. The subjective perception of time was used in some studies as an explanatory factor for the differences between individuals (e.g. Bluedorn 2002; Shipp et al. 2009; Zimbardo and Boyd 1999). Since, however, only research at the individual level is available here, research should be expanded to the aspect of teams. Especially in teams it is of special interest to examine how a different temporal focus of the individual in a team can influence decisions and actions and which consequences result from this (e.g. Mohammed and Harrison 2007; Mohammed and Nadkarni 2011; Montoya-Weiss et al. 2001; Nordqvist et al. 2004). This aspect is also interesting against the background of targeted training in teams. If the individual cannot be understood correctly and the interplay in the team cannot be fully examined, there is a danger that training courses in companies cannot be properly designed and carried out. Therefore, research should be expanded so that training programs and intervention programs for teams can be designed correctly and there is no longer the question of where to begin with the design of the programs if there is uncertainty about the team and the actions in the team itself (Mohammed and Harrison 2013).

Further research that ties in with this topic should accordingly deal with deriving action implications for the optimal composition of teams against the background of different temporal focuses. Research is currently showing great interest in this aspect in particular. Some studies

deal with the factor of time-based personality traits and the resulting consequences and derivations that can be made on the basis of time-based differences (e.g. Mohammed and Harrison 2007; Mohammed and Nadkarni 2011; Montoya-Weiss et al. 2001; Nordqvist et al. 2004; Kabanoff and Keegan 2009). This research interest should be enriched by further studies with research-relevant contents and supplemented by the aspect of the effectiveness and composition of teams with different temporal focusses of the individuals.

In addition to the aspect of teams with regard to temporal focus, further research approaches should be considered in the context of future research. Basically, the concepts developed in Study 2 should be validated and further empirically tested and investigated. In addition, the concept should be further developed and new aspects should be included, which can also play a role in the decision-making of the individuum with different temporal focus. Further potential influencing factors should be identified which could have an influence on the construct presented in study 2. One aspect that can be of great interest here in further research is the aspect of culture-specific differences. Due to the fact that the database of study 2 refers to companies based in the Netherlands, it should first be critically questioned whether there are culturally related influencing factors that can influence or moderate the relationship between temporal focus and the innovation decisions.

In addition to this approach for further research, the aspect of ambidexterity would be another fruitful avenue as this was not explicitly tested for in this dissertation. Previous research has shown great interest in the emergence and impact of ambidexterity (Gibson and Birkinshaw 2004; Mom et al. 2009), which would be expressed here by the simultaneous presence of explorative and exploitative innovation. The simultaneous presence of both forms of innovation is of particular interest because research argues that only the presence of both forms of innovation can achieve an adequate balance between sufficient innovation, improvements and progress as well as prosperity (March 1991). In the context of previous research results, purely

exploitative innovation proved to be particularly important in order to achieve short-term increases in efficiency and to secure a strong position in the market, however, this may come at the costs of long-term losses (Koberg et al. 2003; March 1991; Kammerlander et al. 2015; Ahmadi et al. 2017). On the contrary, explorative innovation leads to particularly high costs and even if many new discoveries are made, the further development of existing processes or of methods such as the explorative innovation processes themselves are not taken into account with regard to further development. Accordingly, research shows that the balance between the two forms of innovation can be a decisive factor for the success of a company (O'Reilly and Tushman 2011; Chang et al. 2011). Consequently, it is of interest to place the research results on ambidexterity of the innovation forms in the context of the findings from research on temporal focus and to examine what effect a temporal focus of an individual or even of teams can have on ambidexterity and the decision-making in this context and what implications for action or managerial implications result from the contexts identified here.

In addition to the findings on further research approaches resulting from the second study, approaches and recommendations for future research can also be derived from the findings of the direct study. In the third study of this dissertation, the results of the second study were examined on the basis of a broader sample and showed a different picture of the influence of temporal focus on the innovation decision than the results of the second study. Although temporal focus plays a decisive role for managers, this statement cannot be generalized to all individuals. This shows that the effect of temporal focus should be further investigated and validated in the context of further research. It should be critically examined whether and what extent the temporal focus can change over time and which determinants and mechanisms are underlying a possible change of one’s temporal focus. Further research should also be conducted to determine what influences a changed temporal focus has and whether there may even be overlaps or dependencies between the different temporal foci. Also, with regard to the different results between study

two and study three, further research should be conducted to investigate the differences between managers and persons who do not belong to the management team when it comes to the potential influence of the temporal focus on the innovation decision.

The results of the third study also showed that risk-taking propensity can have a decisive influence on the innovation decision. This finding also offers scope for further research in relation to entrepreneurial decision-making. The scarce previous studies, which examined the influence of psychological attributes on explorative/exploitative innovation decisions did not take risk-taking propensity as an alternative explanatory variable into account (Ahmadi et al. 2017; Lavie et al. 2010). Therefore, the findings of this dissertation encourage scholars to conduct future research on psychological factors on exploration and exploitation with risk-taking propensity as predictor or control variable.

In addition to the factor of risk-taking propensity, this dissertation also revealed the influencing factor of environmental dynamism as a decisive element in entrepreneurial and managerial decision-making. Environmental dynamism was manipulated within two experimental studies, so the setting presented here differs fundamentally from non-experimentally, real environmental dynamics. Studies have already shown that such limitations of the representations, here of environmental dynamism, can have an influence on the decisions as well as the behavior of individuals (Levitt and List 2007; Lazear et al. 2006). Consequently, further research approaches should be used to examine the extent to which the statements on the effect and moderation by environmental dynamism are robust, if the environmental dynamism can be measured and verified in real scenarios and if corresponding actions can be shown that can be influenced by the different environmental dynamism in a non-experimental environment.

In summary, this dissertation supplements research with statements that are intended to contribute to improving entrepreneurial and managerial decision-making in relation to decisions that have to be made in the context of entrepreneurship and in companies. Important topics such

as entrepreneurial failure or various forms of innovation, for example to counteract entrepreneurial failure, were examined, tested and questioned here. It came to light that some psychological factors, such as the perceived costs of failure, which affect the perception of entrepreneurs in relation to the processes of failure, or the perception of entrepreneurs of the factor of time, i.e. temporal focus, have a decisive influence on the procedure in entrepreneurship and management, both in the processing of past events (failure) and in the form of progress, i.e. explorative or exploitable innovation. Within the framework of further research approaches, the contexts of action identified here can thus be used and expanded to improve decision-making processes and to make a targeted contribution to entrepreneurial success through concrete measures. I hope that the analyses and findings of this dissertation inspires future behavioral decision-making research on both individual entrepreneurs and those acting entrepreneurially within established companies.

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G Appendix

Appendix A Experimental Scenarios

Experimental Scenarios of Study 1:

Scenario 1

Imagine you are a digital manager in a mid-sized company that offers business-to-business (B2B) solutions, in particular payment systems. Part of your tasks there is to promote product digitization in your company. Therefore, you thoroughly following the development and newest trends in the industry.

As a part of your job you are required to vet the implementation of a new digital payment system that the company wants to offer to major customers. You are currently working on a proposal for implementation, which you would like to present to the Executive Board.

Environmental Dynamism Manipulations (control with no treatment/low dynamism/high dynamism):

High Dynamism	**Low Dynamism**
The market for digital payment systems is relatively instable. Products change rapidly and oftentimes, there are disruptive innovations in unforeseeable cycles. The market development is hard to predict. Due to often complete replacement of existing systems as well as the ever-changing customer requirements, companies in this market are under great pressure to maintain their competitive position. High adjustment pressure and many new industry players make the market for digital payment systems a market whose development is very difficult to predict.	The market for digital payment systems is relatively stable. Products change relatively slowly and there are few real innovations. The development of the market can be predicted relatively well. With the continued evolution of existing payment systems and relatively predictable customer requirements, companies in this market are not under as much pressure as in other industries to maintain their competitive position. Low adjustment pressure and few new industry players make the digital payment systems industry a relatively conservative and easily calculable market.

After a careful analysis, you see two viable solutions. The first approach involves strong renewal and change of current product architecture. Such an approach would include the search of radically new technologies compared to previous solutions. This approach holds high potential for the long-term future, but there is also the risk that the technology will not be successfully developed. This solution would promise to take you in a market leading position, however the investment in research and development will be quite high and a possible pay-off is expected to be 7 to 10 years.

The other solution involves an incremental and stepwise adaption of currently existing technologies. This includes the improvement and minor changes to current technologies. In this case, the sales potential for this adjusted innovation is moderate, however, it ensures compliance with existing processes and there is little risk that the product is not successfully developed. This solution promises rather safe results which are expected to be obtained in the next 2 to 5 years. Research and development expenses are estimated to be relatively little as this solution is based on existing technologies which are adapted and refined. However, there might be a risk that there will be technological disadvantage in the long-term future.

Which of the two solutions would you present and suggest to the executive board?

Scenario 2

Imagine you are a strategic product manager in a telecom and communication vendor. This vendor provides products and services to other businesses. There, you are responsible for defining product strategies and managing some interactions with customers in order to secure long term product development and evolution.

For the customers in your market, streaming has become more important in recent months. For the transmission of major international events, some large potential customers seek new digital streaming offerings characterized by speed and stability in transmission. You received information that some of your largest customers have made decision to utilize streaming solutions in the next years. This implies the need for some preparation and response from your side concerning adaptions in the products and services you are responsible for.

In a meeting with the board you receive more information regarding the conditions in which environment the company operates.

Environmental Dynamism Manipulations (control with no treatment/low dynamism/high dynamism):

High Dynamism	**Low Dynamism**
The industry is highly uncertain and instable. The market is characterized by rapid changes and disruptive innovations, which, however, occur in unpredictable cycles. Rapid development of existing systems requires companies to keep abreast of developments in the market and to implement them in order not to lose their competitive position. High adjustment pressure and many new industry players make the streaming services industry a dynamic, incalculable market.	The industry is relatively stable as there are not many players in the market. The market is characterized by slow changes and innovations that occur in predictable cycles. The stability of existing systems mean that companies can keep their position competitive even without constantly being informed about developments in the market. Low adjustment pressure and few new industry players make the streaming services industry a rather conservative, calculable market.

You've been made responsible by the executive board for managing this case, making decisions and taking action when needed. The board has agreed to provide required

resources. After you spoke with experts and did appropriate research you find that there are two viable solutions.

Solution 1 is to have the IT department develop radically new solutions, which involves significant deviations from previously known approaches and is tailored to the needs of potential customers. This technology holds high potential for the long-term future, but there is also the risk that the product will not be successfully developed. Experts estimate that a new technology could promote your company to a market leading position in the long-term future. However, the investment for the technicians and the development will be quite high. It is estimated that the development will take at least 5 years and there is no guarantee that the development is successful.

The other solution involves making incremental changes to existing streaming offerings in the marketplace by the internal IT team so that the customer's requirements are met but are less individualized and innovative. These are minor changes to existing technologies. In this case, the sales potential for this adjusted innovation is moderate, however, there is little risk that the product is not successfully developed. This solution promises rather safe results which are expected to be obtained in the next 1 to 2 years. Research and development expenses are estimated to be relatively little as this solution is based on existing technologies which are adapted and refined. This solution promises immediate success, however this might come at the cost of an innovation deficit in the long-term future.

Both solutions are available to you, so the question of which solution is implemented depends only on your own judgment.

Additional Experimental Scenario of Study 2:

Imagine you are an innovation manager in a company that takes care of the sustainable processing of plastic waste. There, you will be responsible for developing new strategies to make the processing of waste easier and more environmentally friendly. Plastic waste and pollution through microplastics are a worldwide problem and can lead to damage to the environment and health. This issue is getting more and more attention from customers and other stakeholders. Therefore, the Management asks you to find a functioning and effective solution for the processing of plastic waste.

As the issue of corporate social responsibility and sustainability has gained in importance in recent time, it is important for many companies to work with companies like yours to find solutions to their respective processing problems.

Environmental Dynamism Manipulations (high dynamism/low dynamism):

High Dynamism	**Low Dynamism**
The market in which your company operates is characterized by high competition and many product and service innovations. Due to rapid and frequent changes in customer demands the market development is hard to predict. Your company is under great pressure to maintain their competitive position. Furthermore, volumes of products and services that are to be delivered change fast and often.	The market in which your company operates is characterized by low competition and few product and service innovations. Due to slow and irregular changes in customer demands the market development is relatively easy to predict. Your company is under no pressure to maintain their competitive position. Also, volumes of products and services that are to be delivered do not change fast or often.

A large client has now announced its intention to work with your company. This implies the need for some preparation and reaction on your part with regard to potential customer wishes and which products you can offer and adapt. You are instructed by the Management Board to lead the case, make decisions and act as needed. You receive the information that the client puts particular emphasis on the environmental sustainability of any solution offered to him.

After talking to your team and conducting research, you see two viable solutions:

Solution 1 is to develop a radically new processing solution that deviates significantly from previously known approaches and is tailored to the needs of the potential customer. This approach has great potential for the long-term future, but also carries the risk that the product will not be successfully developed. Your team of experts estimates that a new technology and the acquisition of new customers could put your company in a leading market position in the long term. In addition, a radically new solution would, according to initial assessments, make a strong contribution to the environment and the issue of sustainability. Nevertheless, the development costs for this innovative processing technology are relatively high. The development can also take up to 5 years and there is no guarantee that this innovation has actually been successfully developed in the end and that the new customer will be satisfied accordingly.

Solution 2 is that your team adapts an existing solution that your company already offers. This includes the improvement and minor changes to the existing solution. The sales potential for this adapted innovation is expected to be moderate, but there is little risk that the product will not be developed successfully. This solution promises quite reliable results, which are expected in the next 1-2 years. Research and development expenditure are estimated to be low, as only adjustments are made to existing solutions. This solution promises immediate success, but less innovation potential and therefore less positive impact on the environment and sustainability.

Note that the board provides the resources needed.

Appendix B Scales

Temporal Focus Scale (original scale from Shipp et al., 2009)

On a scale from 1 to 7, how often do you think of the following things?	1	2	3	4	5	6	7
	Never		Sometimes		Frequently		Constantly
I replay memories of the past in my mind	☐	☐	☐	☐	☐	☐	☐
I reflect on what has happened in my life	☐	☐	☐	☐	☐	☐	☐
I think about things from my past	☐	☐	☐	☐	☐	☐	☐
I think back to my earlier days	☐	☐	☐	☐	☐	☐	☐
I focus on what is currently happening in my life	☐	☐	☐	☐	☐	☐	☐
My mind is on the here and now	☐	☐	☐	☐	☐	☐	☐
I think about where I am today	☐	☐	☐	☐	☐	☐	☐
I live my life in the present	☐	☐	☐	☐	☐	☐	☐
I think about what my future has in store	☐	☐	☐	☐	☐	☐	☐
I think about times to come	☐	☐	☐	☐	☐	☐	☐
I focus on my future	☐	☐	☐	☐	☐	☐	☐
I imagine what tomorrow will bring for me	☐	☐	☐	☐	☐	☐	☐

Manipulation Check Environmental Dynamism (adapted from Jansen et al. 2009)

Please answer the following questions as spontaneously as possible.

How did you perceive the external environment of the company?							
	1	2	3	4	5	6	7
The environment seemed unpredictable to me	☐	☐	☐	☐	☐	☐	☐
The dynamics I felt as intense	☐	☐	☐	☐	☐	☐	☐
The customer requirements were very changeable	☐	☐	☐	☐	☐	☐	☐
I found changes in the business environment to be frequent	☐	☐	☐	☐	☐	☐	☐
Demand seems to be changing fast and regularly	☐	☐	☐	☐	☐	☐	☐

Risk Propensity Scale (original scale from Meertens and Lion, 2008)

Please indicate the extent to which you agree or disagree with the following statement by putting a circle around the option you prefer. Please do not think too long before answering; usually your first inclination is also the best one.

	Safety first.	
totally disagree	1 2 3 4 5 6 7 8 9	totally agree
	I do not take risks with my health.	
totally disagree	1 2 3 4 5 6 7 8 9	totally agree
	I prefer to avoid risks.	
totally disagree	1 2 3 4 5 6 7 8 9	totally agree
	I take risks regularly.	
totally disagree	1 2 3 4 5 6 7 8 9	totally agree
	I really dislike not knowing what is going to happen.	
totally disagree	1 2 3 4 5 6 7 8 9	totally agree
	I usually view risks as a challenge.	
totally disagree	1 2 3 4 5 6 7 8 9	totally agree
	I view myself as a . . .	
risk avoider	1 2 3 4 5 6 7 8 9	risk seeker

H Affidavit

Ich, Herr David Prinz, versichere an Eides statt, dass die vorliegende Dissertation von mir selbstständig und ohne unzulässige fremde Hilfe unter Beachtung der „Grundsätze zur Sicherung guter wissenschaftlicher Praxis an der Heinrich-Heine-Universität Düsseldorf“ erstellt worden ist.

Düsseldorf, 23. September 2019

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David Prinz