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RESILIENCE AS AN ORGANISATIONAL CAPABILITY:
A STUDY OF HOW FIRMS SURVIVE AND OUTPERFORM IN DISRUPTIVE TIMES

DIETMAR KAPPEL

SINGAPORE MANAGEMENT UNIVERSITY

2021

Resilience as an Organisational Capability:
A study of how firms survive and outperform in disruptive times

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Submitted to Lee Kong Chian School of Business
in partial fulfilment of the requirements for the
Degree of Doctor of Philosophy in Business (General Management)

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2021

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I hereby declare that this PhD dissertation is my original work
and it has been written by me in its entirety.

I have duly acknowledged all the sources of information
which have been used in this dissertation.

This PhD dissertation has also not been submitted for any degree
in any university previously.

A handwritten signature in black ink that reads "Dietmar Kappel". The signature is written in a cursive, flowing style with a long horizontal stroke at the end of the name.

Dietmar KAPPEL

16 April, 2021

Abstract

Resilience as an Organisational Capability:

A study of how firms survive and outperform in disruptive times

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An environment, in which volatility and deep uncertainty represent the leading paradigm, pressures firms to focus their attention on adapting to disruptive environmental conditions. Although scholarly attention in the firm-level resilience construct has increased over the years, a number of important issues remain underexplored. To advance progress in the field, research is needed on the dimensions of resilient response formulation and enactment, the dimensions of the disruptive environment and situational factors as well as resilience as a latent outcome variable. Based on an in-depth, systematic review of the received literature, this thesis aims to extend the firm-level resilience literature by offering two distinct views of how firms develop, nurture and sustain firm-level resilience: *One*, the conceptual model of resilience capacity proposes a dynamic capability view of the dimensions and capabilities that underpin resilience capacity, thereby informing the capability literature on the capabilities essential to firm-level resilience. *Two*, the empirical study yields an inductive-contingency-based model of resilience that informs literature on the processes, dynamics and behaviours that underpin resilience response formulation and enactment contingent upon situational factors as well as characteristics of disruptiveness by detailing the dynamic, recursive and reciprocal nature of the relationships within the inductive model. In combination, these two views may provide useful insights to inform scholarship and managerial practise.

Keywords: Organisational Resilience, Resilience Capacity, Dynamic Capability Theory, Contingency Theory, Systematic Literature Review, Grounded Theory, Business Dynamics & System Thinking, Theory development

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Acknowledgements

Words cannot express the gratitude I'd like to convey for my supervisor and the chair of my dissertation committee, Dean Gerry George. I feel profoundly humbled and privileged to count Gerry as my mentor on this journey, who always had the patience to endure my learning. Gerry taught me to think, read and write, and always pushed me (and this work) to be better. Most of all, I'd like to thank Gerry for giving me the opportunity to embark on this journey and for patiently teaching me to think differently. I want to thank Gerry for boosting my confidence to pursue this stream of research. I will remain truly indebted to him.

Likewise, I would like to express my deep appreciation to the other members of this dissertation committee, Assistant Prof. Daniel Mack and Prof. Andreas Eisingerich for their continuous support, encouragement, insightful comments, questions and advice to further improve the quality and the intended contribution of my work as well as their time invested at different stages in this journey. I will remain ever so grateful for their continued support.

To all of my interview participants, who, all in senior positions in their organisations, took the time out of their busy schedules to contribute to this journey by readily giving their time to share their experiences, expertise and insights. Their wealth of experience and deep knowledge have formed a key part of the empirical work done in this thesis.

To my family and friends, who, regardless of where they are in the world, always offered a word of encouragement and their support, and helped me endure the ups and downs of this journey. With your help, I was able to start this next chapter in my life.

Dedication

To Sarah, who never allowed me to give up and without whose unconditional love and support, I would not be who I am today.

Introduction

The issue of firm survival in disruptive times increasingly attracts scholarly attention across several fields. In the field of strategic management, this paper joins the conversation on how some firms are able to survive and even thrive in disruptive times while others do not (van der Vegt et al., 2015). More precisely, this dissertation outlines two distinct views of firm-level resilience: a dynamic capability view of resilience capacity and a contingency-based view of how firms formulate and enact responses under disruptiveness. Prior work in this domain has generated important insights, expressed through a number of different perspectives, definitions and views. With a significant portion of the academic conversation being conceptual, scholars have taken a variety of perspectives such as a system equilibrium (Holling, 1973; Meyer, 1982), a capability-based (Coutu, 2002; Duchek, 2020) and a resource-based (Linnenluecke, 2017; Sutcliffe & Vogus, 2003) view. Despite disagreement on a variety of issues, this stream of research concluded on several essential features of resilience such as the resilience outcomes being indirectly observable as a latent outcome variable (DesJardine et al., 2019; Hayward et al., 2010; Ortiz-de-Mandojana & Bansal, 2016) and that resilience can be nurtured (Lengnick-Hall & Beck, 2005; Sutcliffe & Vogus, 2003; Youssef & Luthans, 2007).

However, because of the idiosyncratic perspectives and approaches taken by scholars hitherto, we lack a coherent and systematic understanding of resilience in the management domain, which in turn constrains the theoretical development of resilience as a generalisable organisational construct. Indeed, our current understanding of resilience of the firm is shaped by diverging construct-definitions, by differing theoretical conceptualisations, by inconclusive measurements and by deviating empirical research approaches. Scholars furthermore tend to disagree on the dimensions and capabilities that constitute the resilience capacity of the firm (Conz & Magnani, 2020; Hillmann, 2020; Linnenluecke, 2017). Aspects of the

organisational resilience framework such as the dimensions of resilient outcomes and boundary conditions that moderate the relationships within the focal theory, have thus far received little attention.

The purpose of this thesis is to address these aforementioned gaps in the received literature by exploring *how firms survive and outperform under disruptiveness* through two distinct lenses: the dynamic capability perspective and the contingency theoretical perspective. This thesis proposes a reconceptualised theory of firm-level resilience that endorses a more nuanced view of the antecedents and the environmental conditions that characterise disruptive times, the underlying dimensions and capabilities of firm-level resilience, the boundary conditions that moderate the relationships within the theory, and resiliency measured as outcomes. The conclusion of this thesis is that both the dynamic capability view and the inductive-contingency-based view of firm-level resilience offer important insights for the firm-level resilience literature by informing how firms develop and deploy essential capabilities and how firms formulate and enact responses contingent upon environmental and situational variables. While observing the same phenomenon across both studies, these two distinct views may provide a richer and more nuanced understanding of how firm-level resilience is developed, achieved and sustained in disruptive times.

Chapter 1 provides an overview of the received literature on firm-level resilience through a systematic literature review. The conceptual effort in Chapter 2 proposes a reconceptualised model of firm-level resilience capacity through the dynamic capability theoretical lens (Figure 2), while Chapter 3 summarises empirical findings from the inductive study through the lens of contingency-theory, yielding an inductive-contingency-based model of firm-level resilience (Figure 5). A brief summary, findings and contributions as well as limitations of these studies and potential future research directions conclude this thesis.

Chapter 1: Resilience in the literature

The capacity of a firm to be resilient describes firm behaviours and processes that foster a variety of capabilities, allowing firms to sense threats and explore opportunities, seize and transform assets, enabling firms to survive and even thrive in the face of disruption. Understanding how firms build and retain competitive advantage “in regimes of rapid change” (Teece et al., 1997, p. 510) has been at the centre of attention in the dynamic capability theory. Seeking an explanation for firm-level success and failure (Teece et al., 1997) in disruptive times, this paper adopts a dynamic capability view of firm-level capabilities critical to sustained competitive advantage and superior firm performance in disruptive times. At the core of the dynamic capability perspective rests the notion that sustained competitive advantage is a result of how a firms’ dynamic capabilities enable the management and reconfiguration of its asset and skill base (Teece et al., 1997).

Adopting a dynamic capability perspective in the investigation of firm-level resilience is useful for a variety of reasons. Routed in the resource-based view of the firm and incorporating notions of Schumpeterian innovation-based competition and rents, the dynamic capability view emphasises managerial flexibility in environments characterised by deep uncertainty (Teece, 2019). Traditional approaches to explaining firm-level differences in performance “assume relatively predictable environments” and equate uncertainty with risk (Teece, 2019, p. 17). In contrast, the dynamic capability view explicitly acknowledges deep uncertainty (Teece, 2014a, 2017, 2019). Deep uncertainty often manifests through events that had not been anticipated in environments that demonstrate rapidly evolving disruptive dynamics driven by a variety of external and internal factors.

While prior work in-part adopted a capability-perspective of firm resilience (Darkow, 2019; Duchek, 2020, 2014), empirical findings on the dimensions and capabilities that

constitute resilience capacity as a dynamic capability of the firm remain inconclusive. The dynamic capability perspective offers a particularly informative approach to explaining differences in firm-level performance, competitive advantage and the formulation of responses in disruptive times (Helfat & Peteraf, 2015; Teece et al., 1997). The exceeding utility of the dynamic capability theory for this study rests on the emphasis of strategy, the *what*, over operational excellence and efficiency, the *how*, in disruptive times where environments demonstrate increased levels of volatility (Teece, 2019). Eisenhardt & Martin (2000) note that in high-velocity markets, dynamic capabilities resemble fragile and simple processes that yield uncertain outcomes, idiosyncratic and firm-specific in nature. The capabilities critical to sustaining competitive advantage in disruptive times reside at the individual-, team-, in particular the top management team, and firm-level (Teece, 2019). The *dynamic* aspect of dynamic capabilities emphasises the habitual renewal of skills such that effective responses can be formulated by the firm in accordance to constantly changing environmental dynamics (Teece et al., 1997). This paper suggests an extension to the dynamic capability view in that resilience capacity includes an explorative dimension emphasising the inherently entrepreneurial notion of opportunity seeking.

Important to the development of resilience capacity as a dynamic capability of the firm is the assumption that the firms' policy choices interdepend and evolve over an extended period of time, or longitudinally, that is in contrast to viewing managerial choice as a cross-sectional phenomenon at a specific point in time (Ghemawat & Cassiman, 2007). Earlier scholarship emphasises both organisational learning in building dynamic capabilities of the firm (Teece et al., 1997) and path dependency of choices in strategically dynamic environments (Ghemawat & Cassiman, 2007; Sterman et al., 2007; Teece, 2007; Teece et al., 1997) of disequilibrium. This paper emphasises the notion of disequilibrium and the

capabilities that are essential to value creation and appropriation during such time (Sterman et al., 2007) as the focal environmental condition.

The concept of capability lifecycle stages offers valuable insights on how capabilities develop and evolve over time (Helfat & Peteraf, 2003, 2015) thereby informing scholarship on how resilient capabilities come to exist and that disruptive environments do in fact exert influence on the development and deployment of resilience capacity. This narrative is particularly important for the application of the dynamic capability theory to disruptive times, where the absence of dynamic capabilities *ex ante* represents a disadvantage when entering disequilibrium induced by disruption. Thus, resilience capacity as a dynamic capability of the firm shall be viewed strategically. The essence of what constitutes a capability also reemphasises the importance of capability development paths and learning. That is, a capability requires a minimum reliability in its deployment and repeatability of the activity to constitute a capability (Helfat & Peteraf, 2003). As dynamic capabilities *cannot* be acquired, they have to be built through development and nurturing within the firm (Teece, 2019). This notion further emphasises the importance of fostering an understanding of which capabilities are important during times of disruption and how they can be developed.

Extending a neo-Schumpeterian view of the firm, scholars argue that dynamic capabilities “directly engender rents” (Zott, 2003, p. 120). The dynamic capability view holds that rents flow from “the firm’s ability to reconfigure and transform” (Teece et al., 1997, p. 524), emphasising the role of a firms’ capabilities to develop and deploy its (*strategic*) assets. While previous scholarship emphasised an equilibrium view of Porterian and Ricardian rents, more recent work highlights a disequilibrium perspective in which *action* is emphasised over *possession* and *position*, and entrepreneurial rents are pursued (Keyhani et al., 2015; Teece, 2007).

While prior scholarship in part offered a multi-dimensional view of resilience measured as latent outcome variable (Ma et al., 2018; van der Vegt et al., 2015; Winn et al., 2011), extant opinion continues to remain ambiguous as to what these dimensions are and how those should be measured. Following the dynamic capability view developed earlier (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003; Teece et al., 1997), this paper proposes two-dimensional view of resilience outcomes. The external measure of resilience outcomes is operationalised as sustained competitive advantage, consequently leading to superior firm performance (Newbert, 2008; Powell, 2001) or herein expressed as performance reversion. The internal measure of resilience outcomes is expressed through the notion of enhanced flexibility and adaptability of the firm to its changing environmental conditions (Hamel & Välikangas, 2003; Teece et al., 1997). The two-dimensional view of resilience outcomes enhances the utility of the emergent theory as both the external measure of superior performance, and thus the short- and long-term survival of the firm, as well as adaptability of the firm are explicitly acknowledged.

Prior scholarship remains largely inconclusive on the events, dynamics and environmental conditions that characterise disruptions. Insights from prior work on environmental dimensions (Dess & Beard, 1984; Hitt et al., 1998; Keats & Hitt, 1988) offer a valuable perspective to inform resilience capacity research in that environmental conditions can serve as a means of characterising disruptions. Building a more nuanced view of what constitutes disruption informs both literature and practise by inferring conditional utility of the discrete (sets of) capabilities of resilience capacity contingent upon particular environmental conditions. Earlier work on environmental categorisation emphasised a multidimensional view of the firm-environment relationship (Keats & Hitt, 1988; Romanelli & Tushman, 1986).

The Environment-Organization Interface model by Keats & Hitt (1988) offers a fertile grounding for a categorisation of the environment and a more nuanced view of what constitutes disruptive times for the firm. An emphasis on transformative and distributive action within the RESCAP framework bears its grounding in the firm-environment literature (Keats & Hitt, 1988; Romanelli & Tushman, 1986) and the organisational adaptation literature (Gibson & Birkinshaw, 2004; Levinthal, 1997). While a focus on risk-reduction in disruptive environments through increased diversification might seem intuitive (Amit & Livnat, 1988; Ansoff, 1958; Rugman, 1976), prior work points to a more nuanced view in which contingent upon the prevalent environmental conditions the focus lies on the reduction of uncertainty through simplification of the organisation rather than risk reduction through diversification (Keats & Hitt, 1988, p. 587). This encourages increased focus on the contingent utility of the capabilities that underly RESCAP, to form a dynamic capability of the firm, consistent with changing environmental conditions.

Prior literature – systematic review

The systematic literature review below shall serve as the basis for further study and conceptualisation of how firms survive and outperform in disruptive times. That is, the focus is on how firms adapt to disruptive environmental conditions through formulation and enactment of resilience responses.

Data collection and cleaning. Reviewing the extant understanding of resilience in the business and management research field represents a complex and significant task. Therefore, a multi-dataset and multi-step process of reviewing the current literature is warranted. As a first step, two separate database providers were targeted for the initial data collection: Web of Science (WOS) and EBSCOhost (EBSCO).

Web of Science (Clarivate, 2020). In search 1 a Boolean search for the terms organisational resilien* or organizational resilien* or enterprise resilien* or resilient enterprise or resilient firm in title, abstract, key words limited to the contributions in English in the Web of Science Categories (WC) Business or Management was conducted. This search yielded 189 contributions. In search 2 a Boolean search for resilien* across all available WOS fields in the WCs Business or Management for contributions in English yielded 3959 results. The results from search 2 were ranked by WOS citation count and the top 100 articles by WOS citation count were selected for this review (result = 100). Merge search 1 and search 2: the results from searches 1 and 2 were subsequently merged. After removing duplicates from the merged dataset, 281 unique contributions remained in the Web of Sciences dataset (8 duplicates were removed in the merged dataset from the WOS searches).

EBSCOhost (EBSCO industries, 2020). A third search (search 3) in the Academic Search Ultimate, Open Dissertations and Business Source Ultimate databases within EBSCOhost

(EBSCO) for the same search terms as above in the All Text (TX) and Abstract (AB) field within the Subject Terms (SU) Business and Management yielded 173 unique contributions.

Merging search 1, 2 and 3. The results from the WOS searches and the EBSCO search were further merged to arrive at a combined dataset of WOS and EBSCO searches (n = 452). After duplicates among the merged dataset were removed (n = 43), the merged list was cleaned for non-English-language contributions (n = 3), incomplete records and irretrievable contributions (n = 21), a total of 378 contributions were considered for subsequent categorisation. Little overlap between the two search sources could be observed (n = 43), leading to assume a rather fragmented view of organisational resilience within the management research field.

In step 2, after an initial review, **the exclusion criteria**, for the merged and cleaned dataset of 378 contributions, were defined. Using the initial review process of the contributions as a guide for exclusion criteria formation, such criteria were defined as follows (resulting exclusions n in brackets): 2 – use of the term without relevance to focal research (n = 69), 3 – no use of the phrase (n = 30), 4 – engineering, system and infrastructure resilience (n = 15), 6 – supply chain management research (n = 45), 7 – use of the phrase without explicit elaboration of the concept (n = 52), 8 – psychological capital (PsyCap) organisational behaviour (n = 9). The initial review process covered the reading of each article to gather an overview of the field of study.

For example, through exclusion criteria 2, use of the term without relevance to focal research, contributions were excluded where the term resilience was used, however those papers did not use the term in a form relevant to the focal research questions. Exclusion criteria 3 was defined to exclude articles where the term was not used in either one of the sections of the papers. Through reason 6, focus on supply chain, papers were excluded due

to their sole focus on supply chain management or operations management, considered a too narrow focus for this paper. 19 manual additions were made during the course of the detailed literature review process based on cited references and important contributions to the field that were not listed in the initial search results.

Applying the above exclusion criteria to the merged and cleaned dataset of 378 contributions, manually adding cited reference works and important contributions and further excluding works after a more detailed review, yielded a **final dataset of 168 contributions**¹ (452 initial contributions, less 303 exclusions in total, plus 19 manual additions, yields a final dataset of 168 articles). The detailed review process comprised of an in-depth analysis of each contribution (n = 168) which included multiple readings of each paper as well as summaries of each papers' theoretical underpinnings, conceptualisation, operationalisation and measurement, and outcomes – further details of each paper review are outlined in the back matter contained in Appendix B.

¹ A list of studies that have been analysed in detail is shown in Appendix A

Past research on organisational resilience

While academic interest in organisational resilience has continuously grown in recent years (Conz & Magnani, 2020; Ducheck, 2020; Linnenluecke, 2017), an obligation remains to establish conceptual and empirical clarity, to foster consensus on what aspects constitute, define and describe the resilience construct, which capabilities a firm must possess to survive disruptive events and periods, what are the antecedents of the resilience capacity, which are moderating factors to the relationships within the conceptualisation and what are the consequences, i.e. outcomes. Research on resilience in the business and management context has attracted growing attention from scholars across diverse fields of study, as well as across multiple levels of analysis.

Evolution of resilience research. Further analysing the above mentioned WOS dataset as an indicator shows the growing interest of research on the resilience construct in Business and Management literature over time. Using publications in the WOS dataset as an indicator, one can observe the uptick in number of research articles published from 2011 onwards. In the years between 2000 and 2010 a total of 17 papers were published, while the period between 2011 and 2020 (by June 2020) produced 172 published articles. *Figure 1* gives an overview of selected works over time important to the progress in the field.

Prior reviews. Dedicated literature reviews of research on the organisational resilience construct have been published repeatedly (e.g. Annarelli & Nonino, 2016; Barasa et al., 2018; Bhamra et al., 2011; Hillmann, 2020; M. K. Linnenluecke, 2017; Vogus & Sutcliffe, 2007) with some more recent works focussing on reviews of organisational resilience in specific domains such as entrepreneurship (Korber & McNaughton, 2018) and dynamic capabilities (Conz & Magnani, 2020). The systematic literature review presented in this paper builds upon prior reviews, however, also critically examines extant opinion across a diverse set of levels of

analysis, theoretical lenses, viewpoints and conclusions as well as prior conceptualisations and frameworks.



Figure 1 – timeline of important works (selected works and contributions)

The resulting conceptualisations from prior reviews are frequently subject to an overly narrow focus, inflexible viewpoints and are limited in either methodological approach or scope. Past reviews have commonly focussed on one dimension of analysis, by, for example,

focussing on a limited number of theoretical underpinnings (e.g. Linnenluecke, 2017) or conceptualisations based on relative periods of time (e.g. Conz & Magnani, 2020) while to some degree failing to account for the a multiplicity of levels of analysis, various lenses and theoretical conceptualisations that the research of the resilience construct, in fact, necessitates.

Research domains. Research on resilience has spun across a variety research domains such as psychology, individual psychology, psychological capital (Avey et al., 2008; Luthans et al., 2008), ecology (Folke et al., 2010; Holling, 1973; Walker et al., 2004), engineering (Holling, 1996; Hosseini et al., 2016) and operations management (Ali & Gölgeci, 2019; Sheffi & Rice, 2005). The wide spread of research domains on the one hand implies great interest in the construct across fields and a level of dispersion and divergence of opinion on the focal construct on the other hand.

Level of analysis. Table 1 offers an overview of selected past works focussing on various levels of analysis, covering the country or societal level (Carmeli & Markman, 2011; Dalgaard-Nielsen, 2017), organisational (Lengnick-Hall & Beck, 2005; Sutcliffe & Vogus, 2003; Teixeira & Werther, 2013), team (Barton & Kahn, 2019; Weick, 1993) and the individual level (Hayward et al., 2010; Youssef & Luthans, 2007).

Table 1 – resilience conceptualisation and measurement (selected works)

Unit of analysis	Study	Data	Theoretical lens	Treatment	Measurement	Outcome
Country, society	Dalgaard-Nielsen (2017)	interviews with 12 Danish national security bureau CEOs	Resilience as the guiding principle to manage complex and dynamic threats	Resilience competes with fiscal austerity, resilience and accountability	Prioritisation of fiscal austerity, accountability over delegation and experimentation	The structure and way of public policymaking hinders resilience-building in such organisations
	Carmeli & Markman (2011)	Historical data from 1000 years history of Rome	Capture strategy, governance strategy (p. 324 -329) as well as four supporting tactics: saving power, maintaining a stronghold base, isolating adversaries and creating forward outposts (p. 332)	Resilience as an outcome of the pursuit of capture and govern strategy (outcome)	Integration of capture and govern strategies as well as corresponding tactics	Strategy-tactic framework of capture and govern, the interaction between those and four corresponding tactics to sustain overall resilience; research based on ancient history of Rome
Organisation	Sutcliffe & Vogus (2003)	Conceptual	In the presence of processes that foster enhanced competence, growth and efficacy, resilient responses of the organisation, group or individual (compared with rigid responses) ultimately lead to positive adjustment of the organisation and thereby strengthening such capabilities to yield enhanced future responses to adverse events (i.e. organisational learning)	Resilient response (outcome) as the behaviour (capacity) manifested as broader information processing, loosening of hierarchy controlled decision-making and slack capabilities	Structures and behaviours of the organisation when being faced with adverse obstacles – responses can be rigid or resilient	Reconceptualised view of resilience counters the earlier threat-rigidity view (formulated by Staw et al., 1981); comparing views of resilience from OT perspective (recover and restore) compared with development perspective (rebound, become resourceful and strengthened in the process);
	Lengnick-Hall & Beck (2005)	Conceptual	Adaptive fit assumes a return to equilibrium (longer term) whilst robust transformation (consciously temporary) focusses on the constant change of the firm and its environment; different levels of applicability for adaptive fit and robust transformation (p. 740-743, 748)	When firms face uncertainties, resilience capacity (capacity) enables a firm to decide which responses are required, such that the firm decides between adaptive fit and robust transformation	Robust transformation: alterations in control systems, dynamic capabilities; resilience capacity by measuring mindfulness, sensemaking	Extension of extant view of adaptive fit towards a more dynamic view of robust transformation; introduction of resilience capacity operationalised as cognitive, behavioural and contextual resilience (validity for both new constructs is however only proposed, not tested)

Table 1 – resilience conceptualisation and measurement (selected works) (continued)

Unit of analysis	Study	Data	Theoretical lens	Treatment	Measurement	Outcome
Organisation	Teixeira & Werther (2013)	50 companies over 60 year period	Competitive advantage is achieved through a firm culture that enables continuous re-creation of competitive advantage based on innovation; anticipatory innovation as the key driving force of competitive advantage	Resilience is achieved through the way and process of firms managing innovation (continuous innovation as capability, resilience as outcome)	The level and frequency of constant renewal creates the competitive edge and hence the resilience (p. 341)	The authors somewhat place the sustained competitive advantage in the same dimension with resilience; adaptive innovation enables the achievement of competitive advantage and as such forms a resilient firm
Teams	Weick (1993)	Observations via statistical reports, statements, court reports, photographs	Loss of cohesion of role structure and organisational sensemaking in the face of a crisis by virtue of leadership failures to maintain such structure in the event of crises	Resilience as an indication for the (minimal) organisations ability to make sense and adapt (capacity)	Bricolage, virtual role system, wisdom and respectful interaction	Four potential sources of resilience making teams “less vulnerable to disruptions of sensemaking; firms only have a restricted view of challenges
	Barton & Kahn (2019)	Conceptual, framework	Group relations theory; relational perspective on how adversity triggers anxiety in teams and how this affects organisational resilience	Adversity-triggered anxiety forces individuals on either one of two paths which then impacts overall resilience (outcome)	Conceptual	Two intragroup behaviour trajectories are conceptualised: brittle (defensive patterns, vulnerability) and resilience (defuse and mitigate adversity)
Individual	Youssef & Luthans (2007)	2 studies with one 1032 employees from 135 and two 232 employees from 32 US midwestern firms	The impact of positive organisational behaviour capacities (hope, optimism and resilience) on “work-related employee outcomes” (p. 774)	Resilience (capacity, input variable) as one of three criteria determining positive organisational behaviour (POB)	Impact of psychological resource capacities on performance, job satisfaction, work happiness, commitment	Hope seems to more significantly contribute to job-related outcomes than optimism and resilience
	Hayward et al. (2010)	Conceptual, Modeling	Behavioural decision theory, theory of positive emotions and hubris theory; Resilience through failure	Emotional, cognitive, social and financial resilience indirect outcome of overconfidence (outcome, indirect)	Overconfidence as a predictor of subsequent startup success in response to initial failure	Indirect measurement of resilience; conceptual outline of relationship between overconfidence in one’s abilities and the startup success of entrepreneurs

From the in-depth systematic review of prior works, it can be observed that earlier contributions employed a great variety of **theoretical lenses** underpinning their conceptualisations. Lenses range for example from notions which see resilience as a leading principle to manage threats on a country-level (Dalgaard-Nielsen, 2017), to the idea of positive adjustment during crises, later yielding stronger future responses of the organisation through learning (Sutcliffe & Vogus, 2003), to a firm-culture that enables continuous re-creation of competitive advantage through anticipatory innovation (Teixeira & Werther, 2013), to resilience as a guiding principle based on behavioural decision theory (Hayward et al., 2010).

Treatment, measures and outcomes. Scholars have employed a number of different measures in their studies on organisational resilience. Table 1 provides an overview of selected works, showing that researchers thus far have used different treatments and measures to conceptualise and examine the organisational resilience construct. Moreover, a great variety of examined outcomes can be observed: differences due to indirectly (Hayward et al., 2010) and directly (Morais-Storz et al., 2018) measurable outcomes are visible in prior works. Even though a number of scholars construct their studies and framework so that resilience is an input variable (e.g. Bullough et al., 2014; Youssef & Luthans, 2007), the majority of prior studies view resilience as an indirectly measurable outcome (Bhamra et al., 2011; Hayward et al., 2010; Herbane, 2010; Holling, 1973; Lengnick-Hall et al., 2011; Meyer, 1982; Rudolph & Repping, 2002; Sutcliffe & Vogus, 2003), nonetheless the operationalisation of the outcome seems divergent across studies.

Conceptual differences such as resilience being positioned similarly to competitive advantage (Teixeira & Werther, 2013) and the extension of earlier threat-rigidity views to the notion of robust transformation (Lengnick-Hall & Beck, 2005) further contribute to

scholarship meandering away from a potential point of convergence its views of the concept. Despite the observable implicit concurrence amidst prior work on the indirect measurability of resilience as an outcome, construct definition and operationalisation of such still seems to be in disagreement among scholars.

Prior conceptualisations and dimensions

Table 2 presents a synopsis of prior conceptualisations of organisational resilience, indicating exemplary studies. Prior research has produced a variety of conceptualisations, with, in part, inconsistent theoretical approaches.

A notion borne from the seminal works of Holling (1996), Meyer (1982) and Staw et al. (1981) respectively, is the notion of **equilibrium-disequilibrium**, which emphasises a firm's movement in and out of equilibrium due to disruptions that the firm faces. In their early work, Staw et al. (1981) explicate the notion of threat-rigidity in which the organisation is assumed to yield a potentially rigid response to a threat due to restricted information as well as organisational structure that constrict control. Contradicting the notion of threat-rigidity firm behaviour, Meyer (1982) explicates that organisations react to environmental jolts by increased organisational learning in combination with first- and second-order changes. The author further reasons that adaptation, ideological and strategic variables better predict resilience than slack resources do. The writings of Meyer (1982) and Staw et al. (1981) respectively show a divergent approach to researching the resilient responses by organisations from the beginnings of this research stream in business and management.

A second group of scholars view organisational resilience from a **capability-based perspective**, in which the focus is laid on the capabilities that a firm ought to possess and nurture to survive the impact of disruptions. Such capabilities include, albeit are not limited to, absorption of shocks (e.g. Riolli & Savicki, 2003), ambidextrous and dynamic capabilities

(Ingram & Bratnicka-Myśliwiec, 2019), sensemaking (Tisch & Galbreath, 2018; Weick, 1993) and being flexible in behaviour and organisational responses (Sheffi & Rice, 2005; Vogus & Sutcliffe, 2007).

A third perspective, the **cognitive perspective**, focusses on managerial cognition relative to a variety of domains, where resilience is viewed as a latent outcome variable (e.g. Hayward et al., 2010) as well as moderating variable (e.g. Bullough et al., 2014). Scholars employing a cognitive perspective in the study of organisational resilience focus on a variety of notions, such as the impact of resilience on entrepreneurial intentions (Bullough et al., 2014) or resilience as the reason for venture-success post preceding venture-failure (Hayward et al., 2010).

The **resource-based perspective** in organisational resilience research addresses a variety of resources, the utilisation, deployment, re-allocation of which are theorised to enable firm survival in times of disruption. Resources discussed in prior works include slack, financial, personal, family, structural, cognitive, relational and emotional. Sullivan-Taylor & Branicki (2011) for instance base their conceptualisation of resilient SMEs on financial, physical, human and organisational resources (p. 5567; following Barney, 1995) while Richtnér & Löfsten (2014) focus their underlying reasoning on structural, cognitive, relational and emotional resources.

Last, resilience in some instances is viewed as a **multidimensional construct**, covering a variety of properties (Hamel & Välikangas, 2003; Lengnick-Hall & Beck, 2005) and related notions such as business model innovation (Buliga et al., 2016), in which the re-combination of resources and capabilities is seen as the key to firm survival, or the multi-level and multi-dimensional construct of sustained competitive advantage (J. H. Lee et al., 2013; Teixeira & Werther, 2013). Conz & Magnani (2020) conceptualise a multi-dimensional, temporal view of

organisational resilience, in which they outline resilience as a proactive, adaptive, reactive and dynamic attribute of the organisation. Ducheck (2020) outlines a processual view in combination with a focus on resilience capabilities to arrive at her conceptualisation of the organisational resilience construct (p. 224).

Prior definitions

The current understanding of construct definition too varies considerably. As the résumé in Table 2 shows, scholars have employed a number of different viewpoints to the study of resilience, which yield in-part contradictory construct definitions. Early definitions of organisational resilience include notions of resilience as an outcome of “. . . responses [that] create negative feedback loops that absorb jolts’ impacts” (Meyer, 1982, p. 520). Staw et al. (1981), failing to mention the term resilience in their paper, offer a threat-rigidity view, which postulates that when firms are faced with disruptions, threats, the individual, team or organisation resorts back to rigid behaviours in which information processing and control are restricted. The authors do however offer a definition of “corporate collapses can be viewed as failures to alter response in the face of environmental change” (Staw et al., 1981, p. 501), somewhat reaffirming a definition of resilience as an outcome.

Later work expanded the focus on “[t]he skill and the capacity to be robust under conditions of enormous stress and change” (Coutu, 2002, p. 52) or “the ability to dynamically reinvent business models and strategies as circumstances change” (Hamel & Välikangas, 2003, p. 53). Such definitions denote a shift towards a capability or capacity focussed views. Taking a capabilities perspective, a number of scholars used different definitions as a basis for their conceptualisations, for example Sutcliffe & Vogus (2003) refine resilience as “. . . (a) the ability to absorb strain and preserve (or improve) functioning despite the presence of

adversity (both internal adversity [...] and external adversity [...]), or (b) an ability to recover or bounce back from untoward events” (p. 96).

While scholarship had already described resilience as a capacity (e.g. Hamel & Välikangas, 2003, p. 55), Lengnick-Hall & Beck (2003, 2005, 2009) were arguably the most prominent to firstly express an explicit definition of resilience capacity as “. . . a unique blend of cognitive, behavioural, and contextual properties that increase a firm’s ability to understand its current situation and to develop customized responses that reflect that understanding” (Lengnick-Hall & Beck, 2005, p. 750). Later work followed the capacity-view, while taking slightly differing viewpoints in definitional terms (Conz et al., 2017; Duchek, 2018; Kantur & Iseri-Say, 2012; M. K. Linnenluecke et al., 2012) with some work focussing on the capacity for resilience residing in the individuals within the organisation (Luthans et al., 2010; Youssef & Luthans, 2007). Subsequent work employs divergent conceptualisations of resilience capacity. Some scholars focus on the “firm’s capacity for developing organizational resilience” (Lengnick-Hall et al., 2011, p. 248). Scholars in this group view the deployment of capabilities and changes in organisational resource allocation as the capacity and resilience as the outcome. Other scholars however either do not make their definitions of resilience as a capacity explicit or use slightly diverging definitional bases for their conceptualisations. The main views, definitions and conceptualisations are summarised in Table 2 below. What remains however, is the lack of definitional clarity and ambiguity relative to theoretical underpinnings, conceptualisations, constructs and measurement.

The below reconceptualisation of RESCAP utilises a blend of earlier notions to arrive at a converging idea of RESCAP, that shall foster progress in academia as well as increase the relevance for practicing managers.

Table 2 – past conceptualisations of organisational resilience

Conceptualisation, definition	Dimensions	Exemplary studies
<p>Equilibrium vs. disequilibrium</p> <p>time needed to restore prior levels of service (Meyer, 1982, p. 521)</p> <p>“Resilience is the property of the system and persistence or probability of extinction is the result” (Holling, 1973, p. 17)</p>	<p>Threat-rigidity (Staw et al., 1981)</p> <p>Resilience or retention, adapting to environmental jolts (Meyer, 1982)</p> <p>Ecological perspective: pre-crisis equilibrium versus multiple equilibria (Holling, 1996)</p> <p>Absorption of continuous change (Riolli & Savicki, 2003)</p>	<p>(Castellacci, 2015; Coutu, 2002; Gilly et al., 2014; Gittell et al., 2006, 2006; Holling, 1973; Meyer, 1982; Riolli & Savicki, 2003; Sheffi & Rice, 2005; Staw et al., 1981; Vogus & Sutcliffe, 2007)</p>
<p>Capability-based perspective</p> <p>“The skill and the capacity to be robust under conditions of enormous stress and change” (Coutu, 2002, p. 52)</p> <p>“survive in, adapt to, bounce back . . . often thrive” (Ma et al., 2018, p. 253)</p>	<p>Absorption, adaptation, ambidexterity, anticipation, continuous adaptation, flexibility, dynamic capability, entrepreneurial, experimentation, sensemaking capabilities</p> <p>A dynamic, ambidextrous capability (Ingram & Bratnicka-Myśliwiec, 2019)</p>	<p>(Annarelli & Nonino, 2016; Buliga et al., 2016; Coutu, 2002; Darkow, 2019; Duchek, 2020, 2014; Ingram & Bratnicka-Myśliwiec, 2019; Mamouni Limnios et al., 2014; Manfield & Newey, 2018)</p>
<p>Cognitive perspective</p> <p>“enables an organization to notice, interpret, analyse, and formulate responses in ways that go beyond simply surviving” (Lengnick-Hall & Beck, 2005, p. 750)</p>	<p>Entrepreneur-overconfidence as predictor of subsequent venture success (Hayward et al., 2010)</p> <p>Interpreting “uncertain situations more creatively” (Lengnick-Hall & Beck, 2005, pp. 750–751)</p> <p>Conscious of change and judge impact (Hamel & Välikangas, 2003)</p>	<p>(Bhamra et al., 2011; L. J. Branicki et al., 2018; Bullough et al., 2014; Hamel & Välikangas, 2003; Hayward et al., 2010; Ingram & Bratnicka-Myśliwiec, 2019; Korber & McNaughton, 2018; Tikkanen et al., 2005)</p>
<p>Resource-based perspective</p> <p>“identification of relevant resources and capabilities that enable an organisation to prepare for, and respond to, extreme events” (Sullivan-Taylor & Branicki, 2011, p. 5567)</p>	<p>Slack or redundancy, financial, personal, social, family resources</p> <p>Financial, physical, human and organisational assets (Sullivan-Taylor & Branicki, 2011, p. 5567)</p> <p>Structural, cognitive, relational, and emotional resources create capacity (Richtnér & Löfsten, 2014, p. 140)</p>	<p>(Buliga et al., 2016; Gittell et al., 2006; Hamel & Välikangas, 2003; M. K. Linnenluecke, 2017; Sheffi & Rice, 2005; Sullivan-Taylor & Branicki, 2011; Sutcliffe & Vogus, 2003)</p>
<p>Resilience viewed as a multidimensional concept</p> <p>“resilience as firm attribute that evolves in time” (Conz & Magnani, 2020, p. 401)</p> <p>“a multidimensional variable consisting of psychological and dispositional attributes, such as competence, external support systems, and personal structure” (J. H. Lee et al., 2013, p. 269)</p>	<p>Cognitive, behavioural, contextual (Lengnick-Hall & Beck, 2005), dynamic <i>properties</i> (Hamel & Välikangas, 2003)</p> <p>Business model innovation as adaptability (Buliga et al., 2016)</p> <p>Processual view on resilience across different stages (M. K. Linnenluecke et al., 2012; Sutcliffe & Vogus, 2003)</p> <p>Temporal view: Proactive, absorptive or adaptive, reactive, or dynamic attribute (Conz & Magnani, 2020)</p>	<p>(Ambulkar et al., 2015; Buliga et al., 2016; Conz & Magnani, 2020; Hamel & Välikangas, 2003; Lee et al., 2013; Lengnick-Hall & Beck, 2005, 2009; Linnenluecke et al., 2012; Sutcliffe & Vogus, 2003; Teixeira & Werther, 2013)</p>

Chapter 2: Reconceptualisation of resilience capacity

Introduction

The organisational resilience construct to date suffers from incoherent theoretical conceptualisations, diverging definitions, measurements and operationalisations. Thus, advancement in studying resilience in the business and management domain is hampered. Through the analysis of prior works, one can identify ambiguity in construct definition, antecedents and consequences of the construct, critical to stimulate progress in the field. Advances in this research domain ought to be based on a solid construct definition, more detailed and refined conceptualisation, transparent measurement and unambiguous operationalisation of the construct, antecedents and consequences. To arrive at a firm grounding, in definitional terms, one ought to explicitly consider the multi-faceted and multi-dimensional nature of the focal construct. The conscientious scholar ought to scrutinise resilience capacity, or RESCAP, by integrating a variety of angles and by making provisions for a multifariousness of theoretical underpinnings of the construct.

Definition. *Resilience capacity of the firm, RESCAP, is reconceptualised as the capacity of a firm to **recover from disruptions** through the development and deployment of **sensing, exploring, seizing and transformative capabilities** to produce a **dynamic capability** of the firm.*

The underlying conceptualisation maintains notions based on three aspects, below referred to as *first*, recovery from disruption, *second*, the underlying dimensions or capabilities and *third*, RESCAP as a dynamic capability.

First, RESCAP represents the capacity of a firm to recover from disruptions. Recovery in this context refers to multiple aspects. Resiliency as such is seen as the latent outcome as a measure of performance. Some authors describe resiliency as the ability to recover and

bounce back to prior levels of performance or equilibrium (Meyer, 1982; Sheffi & Rice, 2005; Sutcliffe & Vogus, 2003), while other scholars emphasise the ability of the firm to emerge more strengthened and resourceful in the process with references to new equilibria or new and better levels of performance compared with levels prior to disruption (Annarelli & Nonino, 2016; Sutcliffe & Vogus, 2003; Turgeon, 2019; Vogus & Sutcliffe, 2007). Another perspective that scholars use to refer to recovery is such of the continuous adaptation to environmental changes or disruptions (Ates & Bititci, 2011; Duchek, 2020; Hamel & Välikangas, 2003; Ortiz-de-Mandojana & Bansal, 2016). Additionally, a different group of scholars depict recovery as superior competitive advantage and the firm's ability to thrive despite disruption (Conz et al., 2017; J. H. Lee et al., 2013; Ma et al., 2018; Smallbone et al., 2012; Teixeira & Werther, 2013).

Consequently, this paper employs a multi-dimensional view of recovery, in that resiliency as an outcome does not merely connote ideas of bouncing back to prior levels of performance. One ought to additionally consider notions of a more strengthened and resourceful firm (Vogus & Sutcliffe, 2007), the continuous adaptation of the firm to disruptions (Hamel & Välikangas, 2003) and the superior competitive advantage of the firm (Teixeira & Werther, 2013). It seems obvious that recovery refers to the rebound of a firm to previous levels of performance or equilibrium. Recent scholarship has however also suggested an extension of this notion to a broader and more nuanced view of the various dimensions of recovery. Following earlier conceptualisations, as summarised in table 2, RESCAP essentially combines a set of capabilities to ensure both the firm surviving a disruption and the firm thriving to ensure future competitive advantage during times of adversity. The notion of future strength and future competitive advantage are an important emphasis, often ambiguously conceptualised in earlier work. Therein lies a potential paradox:

a firm might survive disruptions with a focus on the deployment of cash reserves or other slack resources (Teece, 2019). In that process however, the firm might not develop the necessary capabilities to ensure future competitive advantage. Consequently, the firm might ensure short-term survival, however medium- to long-term not be able to create and retain sustained competitive advantage. For example, the COVID-19 pandemic that impacts firms and supply chains around the world, does not simply put short-term strain on to firms through dramatic reduction of demand (e.g., travel and hospitality sector), but also inflicts a potential permanent shift in consumer behaviour. A company might survive the direct effects through exploitation of current resources; however, it might not put emphasis on explorative capabilities that allow firms to plan for an underlying change in consumer purchasing power and customer behaviour. This paper views recovery as resilience measured as performance outcomes, competitive advantage which leads to superior-performance and adaptation.

Second, the reconceptualised definition of RESCAP refers to four dimensions, each of which represent capabilities that are both distinct from each other as well as combinative in nature. Distinct insofar as those dimensions constitute clear and firmly established theoretical constructs and combinative as those dimensions are theorised to not yield superior performance outcomes on their own, but through a combination of such capabilities. RESCAP is seen as the capacity to recover through the development and deployment of those dimensions, positioning resilience as a measure of outcome of those underlying capabilities. The definition above based on the analysis of prior conceptualisations leads to reason that the dimensions of RESCAP are also combinative in nature. Combinative insofar as the underlying capabilities build on each other to produce a dynamic capability of the firm that enables resilience as a measure of superior performance outcomes. This is important as earlier conceptualisations of the resilience construct stringently cluster the utilisation of

specific capabilities for example by a temporal dimension or stages (e.g. Conz & Magnani, 2020; Duchek, 2020). The below capabilities are not deployed in a constant manner simultaneously, and thus a temporal clustering of RESCAP to some degree seems reasonable. However, the capabilities necessary to survive a disruptive event and to emerge more strengthened from such crisis can certainly be developed, deployed, optimised and strengthened throughout, prior and post disruption in a non-linear way by moving back and forth between different equilibria and stages of the disruption. The utilisation, development and deployment of the numerous capabilities of course varies and can be contingent upon the presence of disruptions and related dynamics.

The experiences that the firm, teams and individuals gather during a crisis will subsequently impact the development pre- and deployment during the next disruption. Disruptions in most cases cannot be unambiguously and unquestionably identified, categorised and attended to as both opportunities and threats are in a constant state of flux (Teece, 2007). As Teece (2007) notes “most emerging trajectories are hard to discern” (p. 1322). A firm understanding of opportunities and threats that can be easily recognised and those that cannot be easily distinguished ought to be fostered to make provisions for the ambiguity, variability and unpredictability of disruptions. Thus, the combinative, multi-faceted and multi-dimensional nature of the RESCAP construct demands a level of analysis which accounts for the dynamic, volatile, vulnerable and varied characteristics of disruptions.

Third, RESCAP is conceptualised to produce a dynamic capability of the firm. Prior scholarship has extensively elaborated on the difference between capabilities and dynamic capabilities (Teece et al., 1997; Zahra & George, 2002). The understanding of this differentiation is important to form a coherent definitional basis in the discussion of RESCAP. This paper essentially takes a dynamic capabilities perspective, where such capabilities “are

geared toward effecting organizational change” (Zahra & George, 2002, p. 188) and are essential to response activation when firms face high impact disruptions (Burnard & Bhamra, 2011). Resilience capacity, seen as a dynamic capability of the firm, innately incorporates capabilities that ensure both the short- and long-term recovery and survival of the firm, and by doing so, contribute to building, fostering and protecting sustained competitive advantage, in particular in times of disruption. While ordinary capabilities advocate a focus on “doing things right” operationally (Teece, 2017, p. 696), dynamic capabilities focus on “doing the right things” (p. 696) strategically (Teece, 2007, 2014b, 2017, 2019).

The reconceptualised view of RESCAP in table 3 assimilates prior definitions and conceptualisations to form a sound basis for further empirical study. The conceptualisation presented in this paper is neither ambiguous nor tautological. It is grounded in views expressed in earlier work and in firmly established frameworks, subsuming ideas developed over the last four decades of research, and by doing so, yielding a strong basis for further empirical study.

Dimensions of RESCAP

Earlier work discussed the idiosyncratic nature of the capabilities (Eisenhardt & Martin, 2000) relevant to RESCAP. Although the variability of such idiosyncrasy creates some downside for the firm, e.g. limited reproducibility across firms and sectors, it also creates upside in that it enables the creation of sustained competitive advantage (Zahra & George, 2002), that is, by virtue, unique to the firm and therefore distinct from those of other firms' advantages. Central tenets of the dynamic capability theory are the distinctive characteristic that allows such capabilities to engender rents and to form competitive advantage of the firm (Dierickx & Cool, 1989; Teece, 2007; Teece et al., 1997). The quality of dynamic capabilities stem from the replicability within the firm and the non-imitability of such capabilities by competitors (Teece et al., 1997). While the firm aims at limiting imitability, it pursues replicability across the organisation, which in part is contradictory in that the easier the replication within the organisation, the easier the replication outside the firm.

The four capabilities outlined below – sensing and exploring, seizing and transforming – present the four dimensions of RESCAP. The combination and the reconceptualisation of these dimensions shed new light on the complex and dynamic nature of RESCAP. Consequently, the reconceptualised view of RESCAP aims to solve the issues outlined above and advance academic progress in this important and most relevant discussion. Importantly, the reconceptualisation of RESCAP captures the multidimensional nature of the construct where a firm has to simultaneously sense threats and explore opportunities as well as seize and transform current and future assets. This multifaceted view is appropriate as it captures the complexities and dynamics for a firm that is confronted with disruption.

Table 3 – resilience capacity: main dimensions and capabilities, reconceptualised

Dimension, capability	Related constructs	Role and importance	Exemplary studies
Sensing (cognition)	Absorptive capacity Assimilation (managerial) Attention Categorisation (managerial) Cognition Peripheral vision Weak signals, meaning	<ul style="list-style-type: none"> ○ Classify disruption ○ Direct managerial attention ○ Managerial cognition and decisions ○ Sensing of (weak) signals 	(Burnard & Bhamra, 2011; Coutu, 2002; Granovetter, 1973; Haeckel, 2004; Lengnick-Hall & Beck, 2009; M. K. Linnenluecke et al., 2012; Ocasio, 1997, 2011; Stubbart, 1989; Teece, 2007; Tisch & Galbreath, 2018; Vogus & Sutcliffe, 2007; Weick, 1993; Zahra & George, 2002)
Exploring (opportunity seeking)	Business model Experimentation (anticipatory) Innovation Parallel play Pivot, Reinvention Real options Strategic choice Variance increasing	<ul style="list-style-type: none"> ○ Future, long-term competitiveness ○ Innovation ○ Opportunity seeking ○ Risk taking ○ Strengthen the future firm 	(Buliga et al., 2016; Donnellan et al., 2007; Gilly et al., 2014; Hamel & Välikangas, 2003; Herbane, 2019; Kantur & Iseri-Say, 2012; Kirtley & O'Mahony, 2020; Lampel et al., 2014; M. K. Linnenluecke, 2017; March, 1991; R. McDonald & Gao, 2019; Teixeira & Werther, 2013; van der Vegt et al., 2015)
Seizing (asset efficiency)	Agility Asset efficiency Diffusion of knowledge Implementation Short-term survival Seize opportunities Variance decreasing	<ul style="list-style-type: none"> ○ Flexible and efficient deployment of resources and capabilities ○ Short-term and survival ○ Seize opportunities 	(Clément & Rivera, 2017; Duchek, 2020; Ingram & Bratnicka-Myśliwiec, 2019; Mamouni Limnios et al., 2014; McDonald & Eisenhardt, 2019; Ortiz-de-Mandojana & Bansal, 2016; Rhodes & Stelter, 2009; Uotila et al., 2009; Vogus & Sutcliffe, 2007)
Transforming (asset re-distribution)	Ambidexterity Diversification Reduction of uncertainty Re-organisation Resource re-allocation Risk reduction Strategic flexibility	<ul style="list-style-type: none"> ○ Balancing exploitation and exploration ○ Expansion ○ New equilibrium ○ Risk mitigation ○ Shareholder value 	(Amit & Livnat, 1988; Ansoff, 1958; Collier, 2018; Coutu, 2002; Farjoun, 1998; George, 2005; Goetzmann & Kumar, 2008; Jorion, 1985; Lu & Beamish, 2004; R. McDonald & Gao, 2019; Neffke & Henning, 2013; O'Reilly III & Tushman, 2008, 2011, 2013; Porter, 1996; Rumelt, 1982)

Sensing

Stemming from the capability and cognitive perspectives of earlier work (e.g. Haeckel, 2004; Teece, 2007), this conceptualisation views sensing as the firm's ability to detect, categorise and make sense of (weak) signals in the environment through channelling of managerial attention, peripheral vision and through fostering managerial cognition patterns. Some firms have developed the ability to advance and deploy superior sensing capabilities that enable detection of environmental dynamics and potential disruptions earlier than their peers. Haeckel (2004) emphasises the importance of the sensing capability by noting that "expanding an organisation's peripheral vision . . . will make meaning out of apparent noise" (p. 181) enabling firms *to do business* in disruptive times. The quality and strength of the sensing capability, both macro- and micro-environmentally, determines whether a firm detects a disruption at which stage. As Paul Schoemaker and George Day provoke "[w]hy did so many smart people miss the signs of the collapse of the subprime market?" (Schoemaker & Day, 2009, p. 81). Their answer is that sensing capabilities are limited or stimulated by individual and organisational biases (Schoemaker & Day, 2009). Biases which may, to a great extent, impede organisational sensing and thus cause a delay in detecting a shift of dynamics and upcoming disruptions in the environment of the firm (Shimizu & Hitt, 2004).

Scholars ought to entertain a multi-level view of sensing as one of the foundations of RESCAP. Multi-level insofar as one ought to consider that sensing without sense-making, that is to produce meaning important to managerial action (Schoemaker & Day, 2009), might mislead managerial decision making in firms. Inference to the ability to transform (weak) signals into meaning, useful and actionable for the decision making processes, ought to be made (Haeckel, 2004). Thus, the sensing dimension within the resilience capacity framework can intuitively be viewed as a combination of earlier capability-based and cognitive

perspectives, to form the cognitive dimension of RESCAP. As outlined in table 3, the sensing dimension of RESCAP integrates the abilities of the firm to sense and make sense, to channel managerial attention and categorise disruptions appropriately, and to expand peripheral vision. The sensing dimension enables the firm to detect signals, by doing so, firms can increase the probability of early signal detection of disruptive events and consequently more quickly formulate the *appropriate* responses. While the sensing dimension of RESCAP includes notions of sensing both opportunities and threats in the market (Teece, 2007), it is the inherently entrepreneurial exploring dimension of RESCAP that specifically focusses on the discovery, assessment of and experimentation with opportunities. The exploration dimension extends the sensing capability to explicitly include the active, purposeful and entrepreneurial opportunity seeking capabilities of the firm.

Exploring

While firms that are confronted by disruption intuitively prioritise survival of the firm over other goals, such firms ought to also employ a range of explorative capabilities, entrepreneurial in nature. Grounded in a set of diverse perspectives epitomised in table 2, the exploration dimension describes a firms' capability of increasing variance, discovery, search (March, 1991; Uotila et al., 2009) through activities such as experimentation, innovation, reinvention, increase strategic variance, pivoting, parallel play and the utilisation of real options. As noted by March (1991, p. 85) "the essence of exploration is experimentation with new alternatives". The exploration dimension of RESCAP can therefore essentially be seen as an inventory of organisational routines of active, purposeful and entrepreneurial opportunity seeking. The assumption therefore is, that during periods of high volatility or intense disruption firms do not just sense signals of threats but do also discover, evaluate and assess opportunities.

Consequently, a reconceptualisation of the resilience capacity framework ought to account for processes and abilities such as business model innovation (Buliga et al., 2016; Ma et al., 2018), anticipatory innovation (Annarelli & Nonino, 2016; Teixeira & Werther, 2013), parallel play (McDonald & Eisenhardt, 2019) and pivot (McDonald & Gao, 2019). The above-mentioned processes and routines enable firms to both explore opportunities to bounce back from disruption (Sheffi & Rice, 2005; Sutcliffe & Vogus, 2003) as well as to thrive during times of disruption (Ma et al., 2018). Further attention ought to be drawn to the opportunities that a downturn brings (Rhodes & Stelter, 2009) as disruptions seem to bring opportunities alike. For example, a disruption might impact customer purchasing behaviour for a particular sector, e.g., retail, and thus severely impact short-term financial fundamentals. The same disruption, however, might also bring opportunities through medium-term changes to consumer behaviour, e.g., a shift to online shopping, through which companies can create new competitive advantages by more appropriately or more profitably serving these customers. The quality of the exploration dimension is a function of how well a firm is able to allocate appropriate resource to exploration activities and the opportunities discovered. The more attention and other resources a firm is able to grant its managers for opportunity seeking and experimentation during a crisis, the more favourable opportunities will be discovered and more likely a positive impact on the change of competitive advantage of the firm can be observed.

The dynamic capability based reconceptualisation of RESCAP proposes the addition of the explorative dimension as a distinct dimension of RESCAP and thus can also be seen as an extension to the dynamic capability framework. Teece (2007, 2014b, 2019) outlined the three distinct dimensions of dynamic capabilities as sensing, seizing and transforming, to which the inherently entrepreneurial exploration dimension would be an addition.

Seizing

At the core of the seizing dimension, the notion of increasing asset efficiency drives managerial action. Following earlier conceptualisations seizing refers to increasing efficiency and improving short-term adaptation of the firm (He & Wong, 2004; March, 1991; Uotila et al., 2009). Stemming from earlier perspectives of resource-based views and capability views, the seizing dimension operationalises notions of implementation and efficiency increases within RESCAP. Firms that are dealing with disruptions seem to be bound to increase efficiency of resources, processes and operations while upholding customer-satisficing quality levels. At the core of the seizing dimension of RESCAP, the focus on increasing asset efficiency centres around agility, diffusion of knowledge, implementation of strategic choices and options, implementation and realisation of opportunities as well as short-term survival and variance decreasing actions taken by the firm.

In his paper on organisational learning, March (1991) relates activities such as choice, implementation and efficiency to a notion of reduction in variability. A reduction of variability through a focus on exploitative activities is argued to lead to a decrease in performance variability in thus an increase in performance reliability (March, 1991). Thus, a focus on efficiency within the seizing dimension of RESCAP seems salient. Capabilities subsumed under the seizing dimension enable the firm to reduce uncertainty, to increase efficiency of existing assets and to implement strategic choices, particularly important during times of disruption. As mentioned above, activities of seizing are essential, in particular when firms face disruptions that force increased focus on cashflow and working capital optimisation (Rhodes & Stelter, 2009). Therein lies a managerial paradox: there is a high level of complexity within the relationship between exploration activities, focussing on opportunity seeking, and seizing activities, focussing on asset efficiency (Uotila et al., 2009). Notions whereby firms ought to

foster capabilities that enable a concurrent focus on exploration and seizing, i.e. ambidexterity, are not new to research or practise. However, the role of ambidexterity within the context discussed here, seems immaturely examined in prior literature. How are firms able to satisfy both, the necessity of exploration and seizing capabilities? How can firms optimise their cashflow and working capital to satisfy demands of efficiency and decrease in variability while pursuing explorative activities that allow the firm to acquire additional strategic options?

A balanced view of exploration and seizing is, according to March (1991, p. 71), essential to [firm]-survival. A complex relationship of exploration and seizing capabilities was noted in prior works (Gupta et al., 2006; March, 1991; Uotila et al., 2009). Complex insofar as explorative activities in some instances seem to precede sensing activities, i.e. implementation inherently seems to be preceded by the identification, evaluation and decision of strategic choices, and in some instances this seems misguided. Complex also refers to the inability of both exploration and seizing to yield impactful contributions to superior performance autonomously (Gupta et al., 2006; March, 1991). “. . . maintaining an appropriate balance between exploration and exploitation is a primary factor in system survival and prosperity” (March, 1991, p. 71).

Transforming

At the centre of the transformative dimension of RESCAP, the focus lies on asset re-distribution, entailing notions of re-organisation (Keats & Hitt, 1988), ambidexterity (O’Reilly III & Tushman, 2013), diversification (Amit & Livnat, 1988), risk reduction and the reduction in uncertainty (Keats & Hitt, 1988). The transformative dimension essentially takes a strategic flexibility (Hitt et al., 1998; Sanchez, 1995) view of RESCAP, which has broadly been described as “firm abilities to respond to various demands from dynamic competitive environments”

(Sanchez, 1995, p. 142). Such flexibility is made explicit through “continuous changes in current strategic actions, asset deployment, and investment strategies” (Nadkarni & Narayanan, 2007, p. 245). The notion of transformative capability within RESCAP ought to include a balancing view of both exploration and seizing activities of the firm, i.e. ambidexterity (Iborra et al., 2020; O’Reilly III & Tushman, 2013). A balance that seems to be of potentially greater importance when a firm faces disruptions, during times when firms ought to satisfy utility functions of a diverse set of stakeholders and goals of the firm concurrently, while under pressure for firm survival (Cruickshank, 2020; Mamouni Limnios et al., 2014). A balance that is further expressed through a focus on appraising both the increase and decrease of variability (March, 1991).

Additional focus ought to be granted to the notion of diversification, that is product-, portfolio- or geographical diversification, i.e. internationalisation, of the firm (Amit & Livnat, 1988; Ansoff, 1958; Delios & Beamish, 1999; Lu & Beamish, 2004). Apart from the ambition to appropriate additional rents through a more diversified firm portfolio, the arguably most important aim of firms’ diversification activities in the context of disruptions is risk mitigation (Amit & Livnat, 1988; Ansoff, 1958; Rugman, 1976). That is, mitigation through means of dispersion among the various business units, companies, regions, product and customer segments of the firm. Through diversification, firms expand their portfolio and are able to actively manage better or worse performing units within the same business to absorb the impact of disruptions. Moreover, the practicing manager will aim for a decrease in portfolio exposure to ensure reduction of risk.

Conversely, with instability being a dominant environmental factor, firms might retreat to simpler organisational forms to reduce uncertainty (Keats & Hitt, 1988). Consequently, one must consider both, the reduction of risk and the reduction of uncertainty as important

building blocks of the transformative capability of the firm, the focus on which is contingent upon environmental conditions. Firms do however also need to exercise caution in prioritising risk and uncertainty reduction over diversification. Bourgeois III (1980, 1985) notes that risk reduction runs counter to opportunity discovery and enactment. That is, a firm ought to deliberately manage risk where a higher level of risk is acceptable based on a higher expected probability of increased returns (Bowman, 1982). The essence of the transformative dimension of RESCAP therefore is the re-allocation of assets in accordance with risk, uncertainty reduction and opportunity enactment.

The quality of the transformative dimension of RESCAP is a function of speed and efficacy of asset re-distribution or realisation of appropriate strategic options as noted within the strategic flexibility view (Hitt et al., 1998; Nadkarni & Narayanan, 2007). The speed of transformation is contingent upon the accuracy of information, which in turn is determined by the sensing and exploration dimensions of RESCAP: the faster and more accurately a firm senses and makes sense of a disruption and the faster a firm identifies alternative paths and strategic choices, the faster a firm is able to re-distribute assets accordingly.

Potential and realised RESCAP

The reconceptualised model of RESCAP assumes that a firm is able to build potential and realised RESCAP. That is, a firm may develop the potential through sensing and exploring capabilities and may realise such potential through seizing and transforming.

Potential RESCAP enables the firm to sense and make sense of signals and seek opportunities in a dynamic and volatile environment, and thus widens or narrows the scope of search. Potential RESCAP represents a subset of RESCAP capabilities: sensing and exploring. A combination that essentially enables the firm to sense and make sense of (weak) signals (Haeckel, 2004; Schoemaker & Day, 2009) on the one hand, while enabling the firm to seek and qualify new opportunities on the other hand (Gupta et al., 2006; Uotila et al., 2009). Neither of the two concepts, sensing nor exploring, are primarily focussed on implementation. Both are however focussed on the firms' ability to detect disruptions early as well as discover strategic options to increase variability necessary for short- and long-term firm survival (March, 1991). Potential RESCAP represent the firms' capabilities to detect signals in the environment of the firm and to explore and qualify options for managerial action. Additionally, the sensing and exploring dimensions ought to be viewed from a multi-level perspective: sensing can be done for both short-term and long-term threats. For example, the impact of extreme weather events yield disruptions that impact the firm in the short-term, while the impact of a global health crisis on consumer behaviour can be seen as rather long-term disruption. Thus, a more nuanced view of the sensing and exploring dimension individually as well as combinative as potential RESCAP seems appropriate.

Realised RESCAP as the second subset of RESCAP, focusses on the enactment of managerial action and opportunities as well as transformative re-organisation. As such, realised RESCAP incorporates notions of asset efficiency and asset re-distribution. Contrary

to potential RESCAP, realised RESCAP lays the focus on efficiency increases and variance decreases (March, 1991). The realised RESCAP subset represents the firms' capacity to implement opportunities explored, to make changes to firm structure and that lead to increased asset efficiency and effectiveness. Realised RESCAP further refers to changes in asset allocation, for example changes in investment planning and execution, and asset efficiency and structural changes to the organisation that enable appropriate response formulation to changing environmental dynamics. Realised RESCAP thus focusses on the enactment of managerial action and opportunities, that is increasing variance as well as reducing risk and uncertainty through diversification.

Relationship among both, potential and realised RESCAP. Neither of the two subsets, potential and realised RESCAP, is capable to yield resilient outcomes measured as superior performance of the firm during disruptive times, independently. Further, neither one of the two subsets with RESCAP independently function within, in that sensing and exploring are as intricately linked with one another as are the seizing and transforming capabilities. While the exploration capabilities are also somewhat contingent upon the quality and speed of the sensing function, the increase in asset efficiency also impacts the transformative capability.

Temporal dependencies, for example an opportunity may have to be explored first before it can be implemented, and other relations within RESCAP have to be conceptualised. While a high level of potential RESCAP amounts to the potential for better firm performance, it indeed does not guarantee such. Likewise, potential RESCAP is necessary but insufficient if the realisation of the potential RESCAP cannot be guaranteed. Firms that sense signals and explore opportunities but lack the seizing and transforming capacity to realise those potentials are arguably less successful, similar to firms that show high levels of realised RESCAP without the appropriate focus on the creation of potential RESCAP.

A conceptual dynamic capability model of RESCAP

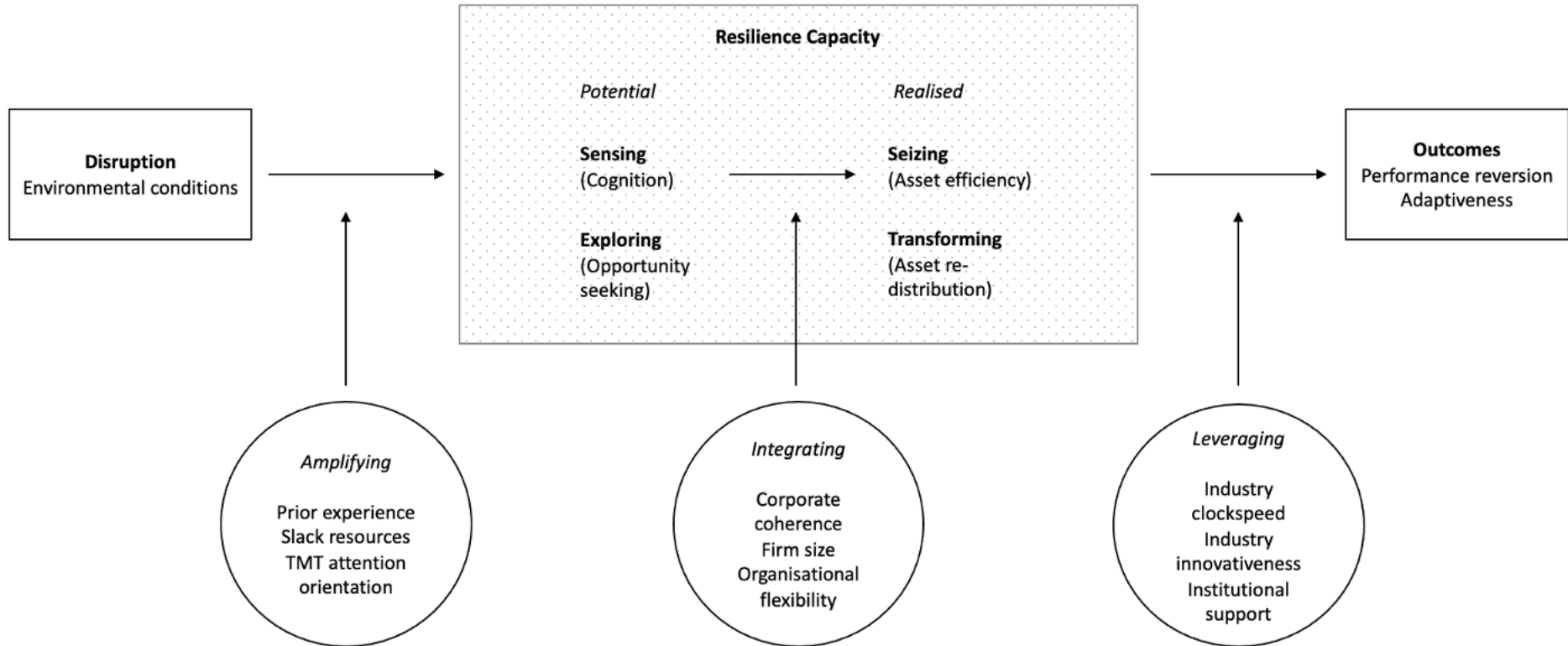


Figure 2 – conceptual RESCAP model reconceptualised (own illustration)

Antecedents

Antecedents to the capabilities that form RESCAP, primarily relate to disruption-specific attributes. While on the one hand prior scholarship has used a myriad of diverse and heterogeneous descriptions of what constitutes a disruption, other work on the other hand simply lacks clear and unambiguous definitions of the environmental conditions that constitute disruptive periods. Extant works investigated the impact of a multitude of events on firms, for example firm-external disruptions such as the impact of extreme weather events or climate change (Ingirige et al., 2008; M. K. Linnenluecke et al., 2012; Tisch & Galbreath, 2018) and supply chain disruptions (Sheffi & Rice, 2005). Scholars have also investigated disruptions caused by accelerated change (Teixeira & Werther, 2013) resulting in technological discontinuities, geopolitical turbulence, changing consumer behavioural trends and an influx of non-traditional competitors (Hamel & Välikangas, 2003), while other works examined disruption caused by firm-internal events such as failures in high-reliability organisations (Gifun & Karydas, 2010).

Scholars have used a variety of terms to describe disruptions. Examples of which include environmental jolts (Meyer, 1982), adversity (Staw et al., 1981), failures (Bruneau et al., 2003), disaster and system disturbances (Gifun & Karydas, 2010; Mamouni Limnios et al., 2014; Weick, 1993), shocks (Mzid, 2017), adverse events (van der Vegt et al., 2015), discontinuities and disruptions (Burnard & Bhamra, 2011), threatening and stressful external event (Iborra et al., 2020), downturn and economic crisis (Rhodes & Stelter, 2009), discontinuous change (Birkinshaw et al., 2016; Teixeira & Werther, 2013), turbulent environment (Ates & Bititci, 2011) and volatile environments (Bourgeois III, 1985). While the nomenclature outlined above has been used to describe an event or a period of time, most definitions remain ambiguous and lack greater levels of detail. Additionally, other scholars

have altogether refrained from explicit definitions of what triggers volatile dynamics that lead to shifts in equilibria. The ambiguity and lack of clarity in defining what constitutes disruptive times, how it can be delineated from other notions such as *typical competition* and what shall be included in this construct, brings additional difficulty to the discourse on RESCAP. To facilitate progress in the field, an explicit definition of the phenomena ought to be established.

A disruptive environment can be induced by dynamics either endogenous or exogenous to the firm, or a combination of both. Furthermore, it might be too simplistic to assume that only catastrophes and short-term impacts warrant the description of disruption. Consider the case of the global health crisis started in 2019. There certainly is short-term impact visible, but there also are dynamics that by the end of 2020 still have not passed and hence continue to disrupt entire industries and sectors. Exogenous disruptions have been widely discussed in the literature, for example extreme weather events (M. K. Linnenluecke et al., 2012), environmental jolts (Meyer, 1982) or industry revolutions (Meyer et al., 1990). Such disruptions stem from outside of the firm boundaries and in most cases affect a larger group of firms, thus greater prevalence. Endogenous disruptions emanate for a variety of reasons, such as operational accidents in firm daily operations or staff-strikes.

Environmental conditions play an important role in the organisational adaptation literature. Earlier scholarship established the importance of firms' adaptive capabilities, in that high performing firms may more likely engage in adaptation activities and thus remain high performers over time (Keats & Hitt, 1988; Romanelli, 1991; Romanelli & Tushman, 1986). A number of scholars have brought clarity to the firm-environment relation and the impact of environmental conditions (Bourgeois III, 1980; Bourgeois III et al., 1978; Hitt et al., 1998;

Keats & Hitt, 1988; Romanelli & Tushman, 1986) through the definition of environmental conditions and their impact on firm and market performance.

Following earlier work (Dess & Beard, 1984; Keats & Hitt, 1988; Pfeffer & Salancik, 1978), this paper adopts a multi-dimensional view of the firm-environment: *munificence*, *instability* and *complexity* (Keats & Hitt, 1988, pp. 578–579). *Munificence*, or environmental capacity, describes “the availability of environmental resources to support growth” (Keats & Hitt, 1988, p. 578), that is this dimension should therefore reflect industry growth. *Instability*, or *dynamism*, reflect discontinuities in the focal industry in that this factor serve as an indicator of volatility (Dess & Beard, 1984; Keats & Hitt, 1988). Instable environmental conditions should not “reflect steady growth or predictable cyclicity” (Keats & Hitt, 1988, p. 579). *Complexity* refers to the structure of task-environment elements implied through dynamic industry concentration (Grossack, 1965). The variety, distribution and number of those elements is argued to affect the firms’ ability to acquire and process information, thus industry concentration, i.e. monopolistic structure versus dispersed power structure or start-up firms entering the market versus established firms, serves as an indicator for the complexity that firms face in their task environment in that the more monopolistic the industry-structure, the less complex it seems (Keats & Hitt, 1988).

While all three variables are a suitable description of the environmental conditional factors that allow for an accurate account of the current environmental circumstances, the primary focus lies with the instability dimension as it appears to be a direct indicator of disruptive periods. This paper argues that in highly volatile markets firms ought to develop and deploy resilience capabilities that allow them to adapt and reconfigure their asset base to adapt to changing environmental conditions. Further, the very nature of dynamic capabilities lends support to the notion that possibilities to learn, practise and repeat, such

as a disruptive environment, enable the development of capabilities (Teece et al., 1997). As noted by Teece et al. (1997), “learning is a process by which repetition and experimentation enable tasks to be performed better and quicker” (p. 520). Following the concept of the capability lifecycle (Helfat & Peteraf, 2003) and the strategic aspects of capabilities (Teece et al., 1997), it can be argued that disruptions or disruptive periods provide *cause*, i.e. a common objective to be achieved (Helfat & Peteraf, 2003) and *opportunity*, i.e. to learn, repeat and improve (Teece, 2019), for the firm to build and improve dynamic capabilities. Particularly in disruptive times, dynamic capabilities are geared towards sensing, exploring and seizing opportunities, current and future assets as well as (re-)distributing assets through transformative action.

To answer the fundamental question, what constitutes a disruption, this paper consequently defines the term *disruption* as disruptive and volatile environmental conditions that impact firm operating performance and force the firm to adapt to the changing dynamics and environmental conditions.

Definition. This paper defines disruptive times described by instable environments characterised by high levels of volatility and unpredictable discontinuities induced by dynamics and events exogenous or endogenous to the firm that have a significant impact on firm operating performance.

Earlier scholarship views discontinuous change in opposition to incremental and continuous change as disruptive dynamics that force firms to adapt and transform their organisation, processes and assets (Birkinshaw et al., 2016; Meyer et al., 1990; Prahalad & Hamel, 1994; van Notten et al., 2005).

Following the theory of dynamic capabilities, it can be assumed that disruptions will have a positive impact on the development of potential RESCAP in that the firm is provided

with the opportunity to hone, learn, repeat and improve a dynamic capability that enables flexibility and adaptability of the firm to new environmental conditions. A firm will therefore better be able to sense threats and explore opportunities, important for the firm to develop and retain competitive advantage as a consequence.

Proposition 1a²: *the more instable the environment (volatile, disruptive, turbulent), the more likely the firm will engage in the development of potential RESCAP capabilities.*

While the instability of the environment is a suitable indicator for the overall environmental conditions at a point in time, Rudolph & Reppenning (2002) argue that an over-accumulation of less-intense disruptions may also lead to an overall increased instability and hence volatility in the environment over time. While the firm will arguably be able to cope with instable environments of less intensity, that are spread across a longer period of time, the over-accumulation of such instable environmental conditions within a period time will lead to the development of potential RESCAP.

Proposition 1b: *the higher the number of disruptions over time, albeit less-intense volatile environments, the more likely the firm will engage in the development of potential RESCAP over time.*

² A summary of all propositions developed in Chapter 2 can be found in Appendix C

Moderators

To form a more nuanced and refined understanding of RESCAP, one ought to consider moderating effects of various attributes and characteristics on the relationships between antecedents, RESCAP and resilience outcomes as well as among potential and realised RESCAP. The moderating effects will subsequently be clustered in three distinct groups: *amplifying*, *integrating* and *leveraging* (where the factors subsumed under leveraging will in logical order be developed after the section on outcomes below).

Amplifying (moderates)

As outlined above, the relationship between antecedents and the development of potential RESCAP is a complex connection. Complex, that is there are multiple variables that influence the relationship between antecedent variables and the development of potential RESCAP.

Amplifying describes factors that influence the relationship between disruption-specific attributes and the development of potential RESCAP. The amplifying function of prior experience of the firm, team, individual or even region and country on the impact of disruptions can be of great significance for the impact on the development of potential RESCAP (Collier, 2018; Linnenluecke et al., 2012; Sullivan-Taylor & Wilson, 2009). It is through experience with prior disruptions that learnings from such experiences can be generated. In their study of the impact of terrorist attacks on the British travel and leisure organisations, Sullivan-Taylor & Wilson (2009) assert that prior experiences better enable firms to classify threats and to prioritise such. By drawing from learnings and prior experiences (Bigelow, 1992), the positive impact of disruptions on the cognitive dimension of potential RESCAP can be amplified. Prior experience ultimately improves adaptability, in that more experienced firms are more likely to avoid extremes, being overly cautious as well as being extremely

confident about what is known of the current situation and possible solutions (Weick, 1993). While prior experiences are essential, it is the learning that is generated from those past experiences that leads to more informed decision making (Bigelow, 1992; Lengnick-Hall & Beck, 2009; Weick, 1993). As Lengnick-Hall & Beck (2009) argue, more experienced firms are better able to sense and accept the true reality while questioning fundamental assumptions that might have shifted. Therefore, higher levels of prior experience are more likely to amplify the positive impact of disruptions on the development of the cognitive dimension of potential RESCAP.

***Proposition 2a:** the higher the level of prior experience, the more the positive relationship between disruption and the development of sensing capabilities will be amplified.*

Slack resources accumulated in times of growth (George, 2005) will more likely allow the firm to amplify the positive impact of a disruption (Hamel & Välikangas, 2003) on the development of potential RESCAP. As defined by George (2005) “[s]lack is potentially utilizable resources that can be diverted or redeployed for the achievement of organizational goals” (p. 661). While resource slack is a multi-faceted construct (Bourgeois, 1981), in the context of disruptions slack can be argued to have an effect on the development of potential RESCAP, in particular on the exploration dimension of RESCAP. Basing their research in the entrepreneurial setting, Manfield & Newey (2018) argue that variability is key for firms responding to disruptions. Such increases in variability relates to explorative capabilities, such as innovation, experimentation and pivoting. Prior research has established the positive impact of slack resources on innovative capabilities (Chattopadhyay et al., 2001; Nohria & Gulati, 1996). However, arguments expressed in more recent literature hold a more critical view of slack resources. While excess resources can be seen as inefficient and undesirable in

relatively stable environments (Linnenluecke & Griffiths, 2010), this does not hold in turbulent environments where slack is essential to variance increasing activities. Notwithstanding the above, the managerial paradox of building and reducing slack resources remains an important puzzle to solve. In particular, higher slack resource levels were argued to produce a negative effect, where firms with much larger resource bases are assumed to show behaviours of complacency and irrationality (George, 2005). Thus, a non-linear moderating effect is expected.

***Proposition 2b:** low levels of slack amplify the positive relationship between disruption and the development of opportunity seeking capabilities while high levels of slack impede the positive impact of disruption on the development of opportunity seeking capabilities.*

Following earlier conceptualisations, top management team (TMT) attention is described as the orientation of the TMT to what issues, category or bundles of stimuli managers focus their attention on (Cho & Hambrick, 2006; Ocasio, 1997). Attention orientation thus is “the degree of attention paid to some category of stimuli” (Cho & Hambrick, 2006, p. 455). As limits to what degree attention can be focussed on sectors exist and limit managerial attention (Cho & Hambrick, 2006), the orientation of such attention is even more critical in disruptive times, where attention hitherto is strained. Earlier work for example elaborated on the relative attention orientation of the CEO to scanning when faced with higher levels of uncertainty (Daft & Weick, 1984; Garg et al., 2003). Higher relative orientation of TMT attention towards scanning activities can thus be assumed to be important during times of disruption for the development of the cognitive dimension of RESCAP. Additionally, as levels of attention permit, focus on auxiliary categories such as an orientation

towards explorative activities will enhance the development of the explorative dimension of RESCAP.

Proposition 2c: *the higher the TMT attention orientation on sensing activities, the more the positive relationship between disruptions and sensing will be amplified.*

Proposition 2d: *the higher the TMT attention orientation on explorative activities, the more the positive relationship between disruptions and exploring will be amplified.*

Integrating (moderates)

The relationship between potential and realised RESCAP has been discussed above. The reconceptualised view of RESCAP however holds a number of factors that impede or foster the realisation of potential RESCAP. That is, while a firm might possess high levels of potential RESCAP, the firm might not automatically realise this potential when faced with a disruption. Integrating factors can therefore be characterised as notions that either promote or hinder the realisation of potential RESCAP, thus playing a vital role in fostering resilient firm outcomes.

While diversification forms an integral part of the transformative dimension of RESCAP, coherence within the firm plays an important role in the relationship between potential and realised RESCAP. Corporate coherence, described as within-firm logic that fosters parts of the business to support and reinforce each other (Hambrick, 1997; Piscitello, 2004; Teece et al., 1994), is of particular importance to diversification and strategic action. Teece et al. (1994) view coherence as “a measure of relatedness” (p. 3), where higher levels of coherence among different parts of the firm is due to a common set of characteristics that various units of the firm adhere to. Coherence can further be detailed as “the consistency of strategic choices across business and functional levels of strategy” (Nath & Sudharshan, 1994, p. 43). More

recently, Piscitello (2004) expanded earlier views to define corporate coherence as “interconnectedness between the companies’ technological competencies and their downstream activities” (p. 775). It can thus be argued that more coherent firms more quickly turn actionable insights from the sensing and exploring capabilities into realised RESCAP across the portfolio of competencies and activities.

Proposition 3a: *the higher the level of corporate coherence, the better the focal firm can realise the potential RESCAP.*

Attributes of the firm, such as size, play an important role in the relationship between potential and realised RESCAP. Firm size has long been a focal variable in the study of diversification strategies (Keats & Hitt, 1988), where it is argued that the bigger the firm the more diversification is aimed at reducing risk (Rugman, 1976). Firm size, however, can be seen as more than a promoter of diversification and risk reduction strategies. Defined as total assets of the firm (Hall & Weiss, 1967), larger firm size presumes larger financial resources which allow the firm to promote diversification important to risk mitigation and possess larger asset bases. Larger firms are also argued to be better positioned to “duplicate their structures, diversify their supply chains, increase their insurance coverages or using them for experimentation” (Iborra et al., 2020, p. 2). In the relationship between potential and realised RESCAP, firm size enhances a firms’ capabilities to realise the potential RESCAP through superior resource allocation possibilities and adaptability. Sullivan-Taylor & Branicki (2011) show results of their case study research with SMEs where comparably smaller firms experience inferior results relative to identification of threats, the prioritisation and the (re-) distribution of assets. The notion that larger firms have greater financial resources at their disposal, also leads to reason that such greater resources enable firms to better exploit their

assets to increase efficiency and better re-distribute assets. Thus, larger firm size is argued to have a promoting effect on the positive relationship between potential and realised RESCAP.

Proposition 3b: *the larger the firm, the more resources a firm can deploy and redistribute and thus the better, quicker and more efficiently the firm can realise its potential RESCAP.*

Organisational flexibility, defined as specific firm capabilities that allow firms to adapt swiftly and aptly to shifting environments (Hatum & Pettigrew, 2006; Krijnen, 1979; Teece et al., 1997; Volberda, 1997), plays a particularly important role in the realisation of potential RESCAP. Earlier work views organisational flexibility was coined by two dimensions (Hatum & Pettigrew, 2006; Volberda, 1997), *one* through flexible organisational design (Ackoff, 1977; Foss, 2003) and *two* through new managerial capabilities (Bahrami, 1992; Calori et al., 2000; Volberda, 1997). In contrast to earlier selection perspectives, where organisations are assumed to dying to make way for new organisations, Volberda (1997, p. 182) argues, that firms with higher levels of organisational flexibility tend to be more successful. In particular during times of disruptive changes as they are able to adapt over time to avoid extinction. It can be argued that the higher the level of flexibility within the flexibility mix, the better the firm is able to increase asset efficiency and re-distribute assets to realise its potential RESCAP. Prior scholarship has defined the flexibility mix in three dimensions, operational, structural and strategic flexibility (Volberda, 1997). Firms that are capable of swiftly and efficiently change for example product portfolios and manage external labour (operational flexibility) are assumed to better be able to increase asset efficiency of the firm. Focussed on the renewal or transformation of existing processes (Krijnen, 1979), structural flexibility is achieved through adaptation of internal and external firm structures. Increasing structural flexibility is expressed through changes in organisational design such as amended reporting

structures, business unit structures, profit and loss responsibilities. Strategic flexibility is concerned with the changes of corporate policy of the firm (Krijnen, 1979; Volberda, 1997). The latter represents the most significant flexibility dimension as it aims at the very core of firm policy, developing and enacting alternative courses of action (Sanchez, 1995).

Proposition 3c: *the higher the level of organisational flexibility, the better the focal firm can adapt processes, structures and strategy to better realise potential RESCAP.*

Table 4 – moderators: amplifying, integrating and leveraging

Moderators	Constructs	Role	Exemplary studies
Amplifying	Prior experience Slack resources TMT attention orientation	Amplifying the positive impact of disruption on the development of potential RESCAP	(George, 2005; Epaminondas Koronis & Ponis, 2018; Sullivan-Taylor & Wilson, 2009)
Integrating	Corporate coherence Firm size Organisational flexibility	Increasing the efficacy of the realisation of potential RESCAP	(Hatun & Pettigrew, 2006; M. K. Linnenluecke, 2017; Nath & Sudharshan, 1994)
Leveraging	Industry clockspeed Industry innovativeness Institutional support	Leveraging institutional support and industry characteristics to amplify the impact of RESCAP on resilience outcomes	(Acs & Audretsch, 1988; Dolfsma & Velde, 2014; Finchelstein, 2017; Nadkarni & Narayanan, 2007; Nuruzzaman et al., 2020; Williamson, 1981)

Table 5 – resilience outcomes

Outcome	Operationalised as	Achieved through	Exemplary studies
Performance reversion <i>external</i>	A reversion of firm-performance relative to pre-disruption levels and the competition	Potential RESCAP sense & explore	(Barney, 1991; Conz et al., 2017; Newbert, 2008; Teece et al., 1997; Teixeira & Werther, 2013)
Adaptation <i>internal</i>	Changes in business model, firm structure, diversification, risk and uncertainty reduction	Realised RESCAP seize & transform	(Ates & Bititci, 2011; Hamel & Välikangas, 2003; Epaminondas Koronis & Ponis, 2018; Ortiz-de-Mandojana & Bansal, 2016)

Outcomes

Although differential conceptualisations were employed in prior works, scholarship in recent years seems to agree on viewing resilience as a latent outcome variable (DesJardine et al., 2019; Ortiz-de-Mandojana & Bansal, 2016; Somers, 2009). As noted above, earlier work has examined resiliency in the business and management domain from a number of perspectives and consequently studied a variety of outcomes, through which resilience manifests. Grounded in earlier works this paper conceptualises resilience of the firm as a measure of performance outcome manifested in two main dimensions. *One*, the notion of competitive advantage (Conz et al., 2017; J. H. Lee et al., 2013; Ma et al., 2018; Smallbone et al., 2012; Teixeira & Werther, 2013), which is viewed as an external measure of performance outcome. *Two*, the notion of adaptation of the firm to the changing environment (Ates & Bititci, 2011; Hamel & Välikangas, 2003; Epaminondas Koronis & Ponis, 2018; Ortiz-de-Mandojana & Bansal, 2016). While the multi-dimensional view of resiliency outcomes has been discussed in earlier works (Ma et al., 2018; van der Vegt et al., 2015; Winn et al., 2011), prior scholarship has failed to clearly and explicitly elaborate on the dimensions of resilience outcomes as a measure of performance outcomes.

Dimension one expresses resilience outcomes as sustained competitive advantage of the firm (Conz et al., 2017; J. H. Lee et al., 2013; Ma et al., 2018; Smallbone et al., 2012; Teixeira & Werther, 2013). Competitive advantage is a good measure of the long-term survival of the firm in that a firm must strive for sustained competitive advantage relative to both current and future competition (Barney, 1991). As Teece (2019) notes that “[h]olding cash . . . is a good hedge against positive or negative surprises, but it provides only short-term relief” (p. 17). Thus long-term sustained competitive advantage is achieved through dynamic capabilities (Teece, 2014a, 2014b). The dynamic capability view does not neglect the

significance of *possession of superior resources* (Barney, 1991, 1995) or the significance of *superior competitive positioning* (Porter, 1980, 1996, 1998). A dynamic capability view of sustained competitive advantage extends earlier notions to refine dynamic capabilities “as the foundation of enterprise-level competitive advantage’ (Teece, 2007, p. 1341). In this view, the firm must develop and deploy dynamic capabilities that allow for internal replication and protect from external imitation to achieve and sustain competitive advantage (Teece et al., 1997). This paper adopts a definition of sustained competitive advantage expressed in earlier works in which sustained competitive advantage rests on the implementation of a “value creating strategy [that is] not simultaneously being implemented by any current or potential competitors and . . . these other firms are unable to duplicate the benefits of this strategy” (Barney, 1991, p. 102). More precisely, it is the development and deployment of dynamic capabilities that are “valuable, rare, inimitable and non-substitutable” (Barney, 1991; Newbert, 2007) which leads to sustained competitive advantage (Teece, 2014b). Sustained competitive advantage is furthermore contingent on the continued heterogeneity of the underlying dynamic capabilities (Peteraf, 1993), that is protected from replication by competitors.

While the earlier resource-capability impact on competitive advantage and further superior performance was contested in earlier work (Newbert, 2007; Powell, 2001), the positive impact of superior resource-capability combinations on competitive advantage and superior firm performance was later corroborated (Newbert, 2008). This paper therefore argues that the development and deployment of superior dynamic capabilities, particularly in times of disruption, leads to sustained competitive advantage of the firm and consequently leads to superior firm-operating performance. While the dynamic capabilities that underly RESCAP are assumed to more generally affect resilience outcomes measured through

sustained competitive and adaptation, a differential view is useful for further guidance. That is, the cognitive dimension as well as the inherently entrepreneurial exploring dimension of RESCAP primarily affect the achievement and protection of competitive advantage, thus leading to relative superior operating performance. Earlier work argues that a firm is resilient when it achieves a refined and reinforced competitive advantage as a response to disruptive times (Conz et al., 2017; Lee et al., 2013; Ma et al., 2018; Smallbone et al., 2012; Teixeira & Werther, 2013). Superior sensing and exploring capabilities thus tend to enable firms to better be able to sense underlying (weak) signals and better explore both opportunities and threats important to the implementation of value-creating current and future strategy of the firm and thereby ensuring sustained competitive advantage and superior performance of the firm. Herein, firm-operating performance is operationalised through the measurement of the change of firm-operating performance variables, such as return on equity (ROE), return on assets (ROA) and return on investment (ROI) (Keats & Hitt, 1988) in comparison with pre-disruption levels and competition. The focal outcome variable is viewed as a reversion of performance, implying superior competitive advantage as the cause of such reversion.

***Proposition 4a:** the better developed potential RESCAP, the more the firm will outperform competitors and prior levels of performance through enhanced sensing and exploring capabilities. Firms with higher levels of potential RESCAP are better able to sense (weak) signals, to sense both opportunity and threat as well as seek new opportunities that allows for future competitive advantage.*

Dimension two refers to the notion of continuous adaptation which was noted in earlier work (Ates & Bititci, 2011; Hamel & Välikangas, 2003; E. Koronis & Ponis, 2018; Ortiz-de-Mandojana & Bansal, 2016). Established work posits that firm must continuously adapt and foster capabilities that cater for continuous shock absorption. Such continuous adaptation is

important to the ability of the firm to “continuously anticipate and adjust to their environment, which facilitates the firm goal of ‘zero trauma.’ “ (Ortiz-de-Mandojana & Bansal, 2016, p. 1619). The ability of the firm to continuously adapt, to deploy seizing and transformative capabilities to flexibly and efficiently redeploy and reconfigure assets allows the firm to continuously and flexibly adapt to changing environments, which is essential in times of disruption (Hatum & Pettigrew, 2006; Keats & Hitt, 1988; Romanelli & Tushman, 1986; Teece et al., 1997). While the competitive advantage – superior firm performance notion expresses resilience outcomes as an external measure, the changes in firm-structure, business model, levels of risk and uncertainty across the firm portfolio represent the internal measures of resilient outcomes.

Proposition 4b: *firms with well-developed realised RESCAP capabilities tend to more likely adapt to changing environmental conditions shaped by instability and disruption through enhanced flexibility and efficiency in asset (re) allocation. Firms with higher levels of realised RESCAP tend to better be able to exploit current and future assets as well as reduce risk and uncertainty through transformative action.*

One of the fundamental questions in business and management studies is the question of what causes competitive advantage and intraindustry variance in performance. As scholars have pointed out, resources and capabilities seem to be one major source of such variation (Teece et al., 1997; Zahra & George, 2002). As pointed out earlier, and as an extension to earlier work, firms ought to foster both potential and realised RESCAP capabilities to *succeed* in a turbulent, volatile and dynamic world. Both subsets are combinative in nature, thus attention ought to be granted to both to not simply survive disruptions but also to emerge more strongly from such disruptions to ensure longer-term survival of the firm.

Leveraging (moderates)

The relationship between RESCAP and resilience as measured through performance outcomes is impacted by a group of variables that are summarised here as leveraging. This paper views leveraging as a firm benefiting from industry characteristics and institutional actions to amplify the positive impact of realised RESCAP on resilience outcomes.

Faster **industry clockspeed**, previously defined as the fast “rate of industry change driven by endogenous factors (technological and competitive)” (Nadkarni & Narayanan, 2007, p. 244) will impact the realisation of RESCAP. Industry clockspeed was previously defined by three facets: *product clockspeed*, the rate of change of products within an industry; *process clockspeed*, the rate at which one process technology becomes obsolete in favour of another; and *organisational clockspeed*, which refers to the rate of change relative to strategic action and organisational structures (Fines, 1998 as cited in Nadkarni & Narayanan, 2007). Prior scholarship has further identified three dimensions of industry clockspeed – rate, turbulence and magnitude – to more accurately measure clockspeed (Nadkarni & Narayanan, 2007). It can be argued that a higher level of industry clockspeed will induce additional volatility in the sector and the firm. Such additional volatility adds to the difficult situation firms face when going through disruptive times. Arguably, the more steadily an industry seems to develop, the more focus can be dedicated to RESCAP. Hence a negative impact of higher industry clockspeed on the relation between RESCAP and outcomes is expected.

Proposition 5a: *at lower levels of industry clockspeed, the positive impact of RESCAP on resilience outcomes is amplified, while at higher levels of clockspeed the positive impact of RESCAP on resilience outcomes is negatively moderated as attention is drawn away from RESCAP to satisfy demands arising from high industry clockspeed.*

Particular levels of **industry Innovativeness** are argued to amplify the positive impact of RESCAP on resilience outcomes. Basing their work on *Schumpeter's Innovation Puzzle*, Dolfsma & Velde (2014) measure innovative output as the number of new product announcements and industry innovativeness as the number of innovating firms within such industry. The authors find evidence for a differential impact of firm characteristics, such as size, on industry innovativeness. As industry innovativeness can be seen as a measure of innovative output of an industry (Acs & Audretsch, 1988), one can assume that higher levels of innovativeness imply more opportunity. Higher levels of industry innovativeness however also imply greater levels of competition as more firms produce more innovative output and the pressure for the individual firm increases. Dolfsma & Velde (2014) find that firm size is a predictor of contribution to innovativeness of an industry, arguing that smaller firms, contrary to prior perspectives, have a higher impact on industry innovativeness. Different measures have been applied to examine innovativeness within an industry (Acs & Audretsch, 1988; Dolfsma & Velde, 2014), however what seems conclusive across studies is that innovativeness is measured as output. As such a higher level of innovativeness implies a higher level of competition within an industry. Firms can leverage the level of industry innovativeness for producing resilient outcomes by exploiting lower levels of innovativeness for increased focus on RESCAP and the impact on resilient outcomes.

Proposition 5b: *while at lower levels of industry innovativeness, the positive impact of RESCAP on resilience outcomes will be amplified through increased managerial attention being drawn to RESCAP, at higher levels of industry innovativeness, the more the positive impact of realised RESCAP on resilience outcomes will be negatively moderated.*

Institutional support plays an important role in the relationship between realised RESCAP and resilience outcomes. At different levels, institutions are argued to set the framework for firm embeddedness, formal rules, governance and resource allocation and employment regulations for organisations, thus influencing the portfolio of strategic choices that firms possess (Williamson, 1981). In his study on the impact of state actions on firm internationalisation, Finchelstein (2017) further refines the definition of institutional actions in direct and indirect actions taken by the state to support firms. Direct action refers to the direct involvement of institutions, for example the provision of financial support and legislation of competition policy. Indirect action refers to provisions and policies that indirectly affect the wider audience of firms within an ecosystem (Nuruzzaman et al., 2020). Given that institutions can directly affect policy making and for example warrant the provision of cheap financial resources to organisations, governmental action can be of vital importance, particularly during times of disruption. As discussed above, organisations are better able to flexibly reallocate resources at higher levels of organisational flexibility and with higher levels of slack resources, firms can make changes to resource provision corresponding to environmental demands. This effect, however, can be amplified given institutional support that aims at the provision of for example cheap financial support for firms. While the capabilities view of RESCAP argues that it is the capabilities that firm develops and realises, it can be argued that the impact of realised RESCAP on resilience outcomes across dimension can be amplified if institutional support is given.

Proposition 5c: *the higher the financial institutional support, the more the positive relationship between RESCAP and resilience outcomes will be amplified.*

Discussion

Earlier work discussing the issue of how firms survive and outperform in disruptive times has yielded important findings. However, to facilitate progress in this discussion, the field ought to converge on a number of basic assumptions that allow for theoretical advancement. By grounding its theorising in the capability-literature, more precisely the dynamic capability view, this paper (Chapter 2) aims to inform the literature by conceptualising firm-level capabilities under deep uncertainty (Teece, 2019). Adopting a dynamic capability perspective is exceedingly useful in environments where managerial decision making takes place under deep uncertainty and managerial flexibility is in focus.

Based on an in-depth, systematic review of the received literature (Chapter 1), this paper develops the reconceptualised framework³ of resilience capacity to inform the literature on capability development and deployment under deep uncertainty. Routed in the dynamic capability theory (Teece et al., 1997), this paper elaborates the capabilities that underpin resilience response formulation through distinct dimensions as sensing, exploring, seizing and transforming. While sensing, seizing and transforming are established constructs in the dynamic capability view of managerial capabilities, exploring capabilities represent an important addition. That is, the inherently entrepreneurial dimension of exploring is distinct from sensing in that explorative capabilities purposefully seek opportunities to foster long-term competitive advantage of the firm, while sensing is dedicated towards dynamics in the firm-environment that can be either a threat or an opportunity. Sensing can thus be viewed from a shorter time-horizon, while it is the entrepreneurial exploring dimension that is developed, deployed and nurtured for a longer time horizon. The notion of seizing reframes

³ A comparison of conceptualisations and definitions with prior literature can be found in Appendix D

activities dedicated towards increasing the efficiency of current and future assets, effectuating in nature, that is, focussing on implementation rather than exploring or sensing. The transformative dimension of RESCAP focusses on the re-distribution of assets, with an emphasis on diversification, risk mitigation and reduction of uncertainty. Interestingly, contingent upon the environmental conditions under which a firm formulates and enacts responses, a balance between risk and uncertainty avoidance with activities of diversification ought to be managed conscientiously.

The theoretical model outlined in Figure 2 conceptualises RESCAP as the potential and realised capacity to develop and achieve resiliency in disruptive times. That is, a firm can develop the potential to form superior responses under uncertainty through sensing and explorative capabilities. The same firm, however, ought to ensure enactment, that is the realisation of such potential, through the capabilities distilled as realised RESCAP. The combination of these two dimensions is of vital importance to achieve resilience outcomes under disruptive environmental conditions.

Resilience outcomes are conceptualised as a sustained competitive advantage expressed through a reversion of performance and enhanced firm-level adaptiveness. A change or reversion in performance is achieved through competitive advantage, which is driven by the sensing and exploring dimensions, alias potential RESCAP. More precisely, it is the positive delta that is of interest. Greater levels of adaptiveness are achieved through the development and deployment of seizing and transforming capabilities, that is, through realised RESCAP. These dimensions of resilience, measured by performance outcome variables, foster a more nuanced and holistic understanding of resilience as performance outcome. Importantly, the combination of both dimensions, performance reversion and

enhanced levels of adaptiveness, ought to be considered when aiming to measure resiliency as outcome.

Additionally, the conceptual model suggests moderating variables that moderate the relationships between constructs. Amplifiers for example magnify the impact of the environmental conditions that constitute disruption on the development of potential RESCAP, while integrating variables moderate the realisation of potential RESCAP. Variables that moderate the relationship between RESCAP and resilience outcomes were conceptualised as leveraging.

This paper contributes to the received literature in a number of ways. Conceptualising resilience capacity as a dynamic capability of the firm explicitly extends the dynamic capability theory to environments where disruption is the leading paradigm. The categorisation of disruptive environmental dynamics allows for theorising on capability development and deployment honed not just toward a user-need (Teece et al., 1997, p. 517), but toward a specific disruptive environment. It is through the focus on environmental conditions, rather than specific events, that this view adds value. Based on earlier work (Keats & Hitt, 1988), this paper conceptualises the environmental conditions that are disruptive in nature as disruption by outlining how, in particular, the driving force of volatility as determining environmental condition impacts firm-level capability development and deployment.

This paper extends earlier work on organisational resilience and dynamic capabilities by maintaining a multi-dimensional view of resilience capacity through the illustration of underlying capabilities as well as a multi-dimensional view of moderators and environmental conditions. By extending the initial dynamic capability framework (Teece, 2019; Teece et al., 1997) to include the inherently entrepreneurial explorative dimension, this view caters for

the purposeful shaping of the environment (Teece, 2007) and thereby acknowledges the complex and multi-faceted reality that firms face when confronted with disruption.

By firmly grounding the reasoning in the dynamic capability theory of the firm, this paper further extends earlier work relative to the impact of learning, path-dependency and the emphasis on disequilibrium. While earlier work assumes rather predictable and stable environments (Teece, 2019), this paper refocuses the discussion on firm behaviour in disequilibrium. By outlining the distinct dimensions of RESCAP and elaborating on the way how these capabilities are developed and deployed, this paper contributes to the issue of how learning impacts capability development and consequently performance.

The multi-dimensional view of resilient outcomes is grounded in the theory of entrepreneurial action, which advocates action over asset possession or competitive position as the main driver of sustained competitive advantage in disruptive times in which the firm engenders both Schumpeterian and Kirznerian rents. The emphasis on managerial action, that is the development and deployment of dynamic capabilities, over possession (Barney, 1991) and position (Porter, 1980, 1996) further contributes to the growing importance of dynamic capabilities for firm-level survival, performance and adaptiveness under uncertainty.

While this paper is firmly grounded in the extant literature and aimed at creating theoretical contribution, these insights shall too inform managerial decision making by outlining the capabilities critical to survival during times of disruption and explicating other important aspects of the theory. Because of incoherence in theorising and empirical findings, the implications of the received insights for practice thus far remain unclear. Due to this incoherence, prior work on how firms survive and thrive in times of disruption has been difficult to apply to managerial practise. The emphasis on dynamic capabilities as the source of sustained competitive advantage in disruptive times over possession and structure of

assets is reinforced by Teece (2019) who notes that “[h]olding cash, for example, is a good hedge against positive or negative surprises, but it provides only short-term relief” (p. 17). This view again stresses the strategic importance of capability development and deployment, particularly in times of disruption. While the asset base of the firm is evidently important to firm survival, i.e. a firm holding excess cash reserves, the emphasis in rapidly changing environments lies on the capabilities essential to develop, deploy and reconfigure those assets to respond to changes in the environment of the firm (Amit & Schoemaker, 1993; Teece et al., 1997). Earlier scholarship on dynamic capabilities advocates a set of distinct capabilities. In particular sensing, seizing and transforming are important dimensions of a firms’ dynamic capabilities portfolio (Teece, 2007, 2017; Teece et al., 1997).

A dynamic capability view of resilience capacity aims to introduce a refined perspective of the capabilities critical to firm survival in disruptive times. The introduction of potential and realised resilience capacity also indicates that resilience capacity as a dynamic capability of the firm is a multi-dimensional construct that targets both the survival of the firm through seizing of current opportunities and the pursuit of future competitive advantage through the creation of new opportunities. The insights generated in this paper emphasise the multi-dimensionality of resilience outcomes, an important extension and reaffirmation for guiding managerial practise. This paper also informs the practising manager by providing a more nuanced view of disruptions and the environmental conditions that lead to the prioritisation of a set of capabilities over another.

Future research

Naturally, this paper is not exhaustive and represents one view of firm-level resilience based on an extensive review of the received resilience literature. While this paper uses a dynamic capability view to explain firm-level resilience, other views could be used to explain firm-level resilience, and thereby expanding upon other views summarised in Table 2. While the dynamic capability view provides a useful perspective to scenarios of deep uncertainty and volatility, it of course has its limitations. Therefore, applying a different perspective to the study of firm-level resilience may yield a different conceptual framework that may induce interesting findings from various domains, such as economics or sociology.

While this paper treats resilience, expressed through adaptiveness and performance reversion, as the independent variable of the model, a different perspective might view the dynamic capabilities that underpin RESCAP as the independent variable. That is, disruptive environmental conditions lead to RESCAP and the underlying dimensions as the independent variable. Following earlier work, resilience could also be viewed as mediator to the relationship between dependent and independent variables (e.g., Collier, 2018; Kantur & Iseri-Say, 2012; Senbeto & Hon, 2020).

The focus of the theory paper is to develop a conceptual model of resilience capacity through a dynamic capability lens. As such, propositions for further study are developed. The conceptual model could be used to extend the conceptual effort to a quantitative, deductive theory testing study. Consequently, further study focussed on quantitative theory testing approaches can shed further light on the validity of the proposed RESCAP model of firm resilience to further extend both the dynamic capability as well as the resilience literature.

Chapter 3: Inductive study

Introduction

As outlined in the above in-depth literature review, the focal research domain suffers from incoherent frameworks, construct definitions and measurements. The inductive study in Chapter 3 shall aim to build theory that is firmly grounded in observation of the phenomenon in managerial practise, that is, inductive theory building through qualitative field research, where the researcher initially is agnostic to the relationships she will observe during the early research process (Glaser & Strauss, 1967).

Qualitative, inductive methodologies grounded in theory are best suited for research where novel frameworks and conceptualisations are studied (Charmaz, 2006; Corbin & Strauss, 1990; Eisenhardt, 1989; Eisenhardt et al., 2016; Eisenhardt & Graebner, 2007; Gehman et al., 2018; Glaser & Strauss, 1967; Strauss & Corbin, 1994, 1997; Turner, 1983). An inductive, qualitative study that is strongly grounded in theory allows for recurring progression from and to data collection, analysis and theorising (Zeithaml et al., 2020), which allows for continuous building of the emergent theory (Eisenhardt, 1989). Chapter 3 shall aim to build an inductive, emergent theory, that is firmly grounded in observation.

Research methods

Conceptualised by Glaser & Strauss (1967), researchers who are applying a **grounded theoretical approach** to building theory initiate the research project without preconception of what they are going to see and are initially agnostic to the relationships they're going to observe. The emergent theory is then viewed as a bridge from inductive approaches that yield qualitative evidence to mainstream deductive research (Eisenhardt & Graebner, 2007). As Eisenhardt & Graebner (2007) point out, researchers ought to justify the application of inductive approaches to building theory as there is " [t]he implicit assumption . . . that

[inductive] theory building . . . is less precise, objective, and rigorous than large-scale hypothesis testing” (p. 26). To justify the approach used in this paper it is imperative to address questions of why the focal research question is better studied through an inductive approach. Conflicting extant theories alone are not a sufficient reason that warrants such an approach (Eisenhardt & Graebner, 2007). It ought to be noted that existing theories and frameworks insufficiently explain the variance in firm survival and behaviour that leads to superior performance. Methodologies grounded in theory are particularly well-suited for studies in which the researcher aims to foster an understanding “of the dynamics underlying the relationship, that is, the “why” of what is happening” (Eisenhardt, 1989, p. 542).

First, research methodologies grounded in theory, are well suited for dynamic phenomena. That is, dynamic in nature of the phenomenon as well as the research process (Corbin & Strauss, 1990) through which the emergent theory gains credibility, cohesiveness and parsimony. *Second*, as the focal methodology is firmly grounded in the data that the researcher is observing, the notion of determinism applies. As Corbin & Strauss (1990) outline, actors “are able to make choices according to their perceptions, which are often accurate, about the options they encounter” (p. 5). Methodologies grounded in theory “[seek] not only to uncover relevant conditions, but also to determine how the actors respond to changing conditions and to the consequences of their actions” (Corbin & Strauss, 1990, p. 5). Building theory through inductive methods, such as qualitative research interviews, is a good fit for the purpose of this study. On the one hand there are competing theoretical frameworks that thus far insufficiently explain the variance in behaviour and outcomes as well as inconclusive theoretical conceptualisation among scholars. On the other hand, the dynamic, complex and changing nature of disruptions, how actors respond to such and the changing environmental conditions under which actors operate warrant further theory building from

inductive methodology, that is grounded in theory. Challenges arising from scholars who favour other research methodologies over inductive, qualitative methods can be met with “precise language and thoughtful research design” (Eisenhardt & Graebner, 2007, p. 30). In part, the focal paper aims to build and test theory concurrently. Testing theory that was developed based on the in-depth literature review above and construct theory by extending, revising and enriching earlier notions of the focal theory.

Evaluating rigor and quality. The aim of this study is to create high-impact and high-quality contribution to the field that furthers both academic understanding and practical action. The results from high-impact theory development yield contributions that are novel, interesting and original (Charmaz, 2006) or as Eisenhardt et al. (2016) denote, demonstrate “thinking big and thinking new” (p. 1119). High quality of research, among other characteristics, manifests in high levels of rigor applied to the research. Eisenhardt et al. (2016) outline three fundamental criteria (p. 1120), that allow for evaluation of the quality and rigor of inductive work. *First*, is this a strong theory, in that the theory is internally coherent and parsimonious? *Second*, are the constructs evidently grounded in the observations? And *third*, “does the research provide rich and unexpected insights?” (Eisenhardt et al., 2016, p. 1121). As is the nature with inductive methods of this kind, the credibility and the quality of the theory development review builds over time as the research process progresses. Particularly during the early stages of a grounded study approach, confidence in the emergent theory and constructs as well as the underlying relationship is increasingly built.

Prior work thus far has reached little consensus on which criteria should be evaluated when judging inductive work, particularly in processes attempting to building theory from qualitative methods, grounded in theory (Eisenhardt, 1989). The below listed evaluation

criteria are not exhaustive, in particular since there seems to be no agreement among scholars on which criteria one should focus when evaluating theory building that is grounded in the data. Analogous to internal validity in theory-testing research, *credibility* evaluates plausibility of the propositions developed within the focal theory (Zeithaml et al., 2020). *Transferability*, or external validity in theory-testing, evaluates the extent to which the focal theory holds in cases not in scope in the current sample (Zeithaml et al., 2020).

Theoretical sampling

This study adopts a theoretical sampling approach, where the researcher collects data in a way that she “jointly collects, codes, and analyses his data and decides what to collect next and where to find them” (Glaser & Strauss, 1967, p. 45). In further defining theoretical sampling, Coyne (1997) notes that “in the initial stages [the] researcher must have some idea of where to sample, not necessarily what to sample for, and where it will lead” (p. 625). This pertains to the notion, that in a research process qualitative in nature and grounded in theory, the sampling of informants is emerging throughout the research process.

Contrary to random sampling in deductive, theory testing work, the researcher samples theoretically relevant data throughout the research process. As outlined by Handler (1990, p. 39), theoretical sampling might appear to be biased and uncontrolled for researchers used to quantitative methods with samples randomly selected from the population. This, however, is rebutted by the structure of the emergent theory, which functions as a control for the data collection process (Glaser & Strauss, 1967). Contrary to statistically relevant sampling in theory testing work, theory building relies on sampling that selects informants for theoretical, rather than statistical reasons (Eisenhardt, 1989). Considering that the number of informants to which the researcher is able to gain in-depth access is generally limited, the researcher shall aim to sample informants and firms which represent polar situations (Pettigrew, 1990).

Polar or extreme situations (Eisenhardt, 1989; Pettigrew, 1990) can for example manifest in low and high performing, or other variability, firms, through which the focal phenomenon can be clearly observed. Sampling polar, in particular disconfirming, firms and informants will further improve the emergent theory.

When the researcher samples firms and actors, where the theory likely does not hold, she increases the quality and cohesiveness of the emergent theory. That is, if the focal theory is reconfirmed by participants who were sampled as disconfirming, in that they're reconfirmation of the theory increases credibility and improves the emergent theory (Pettigrew, 1990; Zeithaml et al., 2020). Theoretical sampling is expressed through a process where the researcher concurrently collects, codes and analyses data and "decides what data to collect next and where to find them, to develop his theory as it emerges" (Glaser & Strauss, 1967, p. 45). In addition, this study draws from samples of firms and participants that satisfy categorisation into different groups through purposeful selection (Eisenhardt, 1989).

Theoretical saturation

The further the progress of the research and theory construction process, the more important becomes the notion of theoretical saturation. In contrast with random sampling in deductive, theory testing studies, sampling in research approaches grounded in theory do not anticipate a predetermined sample size ex ante. Theoretical saturation is reached when additional data collection presumably will not yield further insights into the issue, that is no new findings can be generated through additional data collection and analysis (Zeithaml et al., 2020). Formally expressed, saturation is reached when incremental learning through additional observation is minimal because of the replication of findings (Eisenhardt, 1989; Glaser & Strauss, 1967) and no new themes, categories or insights are expected (Zeithaml et al., 2020, p. 46).

Data collection

Researchers who employ a qualitative, inductive method, are not confined to any particular set of data sources (Eisenhardt, 1989). While qualitative studies are naturally associated with studying qualitative data (Eisenhardt, 1989; Yin, 1981), such studies are not restricted to solely using data of qualitative nature. Furthermore, the combination of both quantitative and qualitative data is seen synergistic and fruitful for various purposes (Eisenhardt, 1989; Yin, 1981), where both data can complement, extend and add to each other. Quantitative data for example can uncover relationships that were not as salient in pure qualitative data, as well as adding insights to arrive at conclusions that potentially would have been made differently if only qualitative data were observed and analysed (Eisenhardt, 1989). Qualitative data can both develop theory directly or give meaning to relationships uncovered through the analysis of quantitative data (Eisenhardt, 1989; Mintzberg, 1979). Mintzberg (1979) notes “[w]e uncover all kinds of relationships in our “hard” data, but it is only through the use of this “soft” data that we are able to “explain” them, and explanation is, of course, the purpose of research” (p. 587).

This study will therefore adopt a multiple data source approach where a combination of rich, qualitative data from discussions with interview partners will be complemented with data from secondary sources. More precisely, the in-depth **Interviews**^{4,5} are semi-structured with informants from firms across a variety of sectors and categories. Interviews last about 45-60 minutes and cover the introduction of the interview participants’ role and responsibilities within the firm as well as questions pertaining to the focal research question.

⁴ Singapore Management University Institutional Review Board approval number IRB-20-155-A104(1220)

⁵ Informed consent was obtained from each participant during the research process. The main elements of the informed consent process as well as content were re-iterated prior to starting each interview. Video and audio recordings are diligently handled as per instructions outlined in the IRB approval document.

An overview of selected interview questions can be found in Appendix E. As part of the research process, the interview questions were modified and extended throughout the process (Eisenhardt, 1989; Harris & Sutton, 1986). A descriptive summary of interview participants can be found in Appendix F.

To ensure **data validity** and reduce informant bias, several steps ought to be taken. *First*, the utilisation of nondirective, open-ended questions and the avoidance of leading questions during the interview was observed to enhance data accuracy (Huber & Power, 1985) and to limit recall bias (Golden, 1992; Koriat & Goldsmith, 2000). *Second*, multiple informants as opposed to single-informants per firm across functional areas and hierarchies enhance information accuracy (Kumar et al., 1993). *Third*, to reduce the likelihood of retrospective sensemaking (Weick, 1993), accounts of both retrospective as well as current data ought to be analysed. That is, because the interviews take place during a disruptive time in combination with retrospective data, the risk of retrospective sensemaking by both the researcher and the informant is reduced (Huber, 1985). *Fourth*, the triangulation of interview data with secondary data acquired through a variety of sources increases confidence in the emergent theory (Hallen & Eisenhardt, 2012). *Fifth*, the provision of anonymity encourages candor among the informants (Hallen & Eisenhardt, 2012; Hannah & Eisenhardt, 2018; McDonald & Eisenhardt, 2019).

Additionally, this study utilises **secondary data** drawn from company press releases, press articles, blogs and analyst reports to complement interview data and for triangulation of the qualitative data (Jick, 1979). Such triangulation allows the researcher to expand theorising to secondary data to validate informants' views, critical for validity increases.

Table 6 – group names and description⁶

Group name	Segment	Type	Employees	Footprint	Informants	Role of informants
BioTech	Bio-tech	Private	10-50	Regional (2 sites)	4	CEO & co-founder, CTO & co-founder, CPO, COO
ChemCo	Specialty materials	Listed	20,000+	Global (140 sites)	4	COO, Executive VP Strategy, President Americas, President Singapore
ServCo	Service	Intra-government ⁷	4000+	Global (115 sites)	6	Head of China (Beijing), Head of Philippines, Head of Thailand, Head of South Korea, Head of Hong Kong, Head of Singapore
SteelCo	Steel	Listed	50,000+	Global (140 sites)	6	Member of the Management Board, Head of Global Operations, President Asia Pacific, President North America, Divisional Head of Benelux, Head of Global Marketing & Sales
Concept	Various	Various	Various	Various	5	Prof. Strategic Management, CEO, Partner, Manager, Founder

Table 7 – overview of data sources

Data source	Type	Purpose	Description
Interviews	Primary	Primary source of qualitative data	In-depth, semi-structured interviews conducted online (45-60 minutes)
Annual reports	Secondary	Triangulation ⁸	Annual reports retrieved online (where applicable, as not all firms are publicly listed)
Earnings call transcripts	Secondary	Triangulation	Retrieved from the firms' website and other media outlets (where possible)
Press releases	Secondary	Triangulation	Retrieved from the firms' website and other media outlets (where possible)
Research memos⁹	Analysis	Written record of analysis	Memos keep record of the analysis done as part of the research process, depicting the thinking, conceptualising and theorising

⁶ Group refers to a group of informants, i.e. the same firm, however, these do not represent cases

⁷ ServCo serves as an intragovernmental organisation that provides services for companies from a specific country in their export-import and internationalisation efforts globally.

⁸ Triangulation of data refers to the use of multiple methods in analysing the data to increase consistency, reliability (within-method) and external validity (between-method) (Bouchard, 1976; Glaser & Strauss, 1967; Jick, 1979)

⁹ Memos are distinct from interview notes as memos are a record of the analysis process where the researcher records thought processes, emergent concepts, conceptualisation and theorising as part of the research process (Corbin & Strauss, 2015)

Table 6 provides an overview of the groups of informants, i.e., firms, from which participants for the interviews were sourced. These firms were purposefully sampled across sectors, sizes and firm type to increase parsimony of the emergent model. That is, heterogeneous samples of firms and informants may help to build a more holistic and nuanced inductive model of firm-level responses during disruption.

Table 7 provides an overview of the data sources used in the inductive study. Examples of secondary data sources can be found in Appendix J. These secondary data were particularly helpful in the later stages of the research process, where relational meaning between concepts and constructs was established to form the emerging model of firm-level resilience in disruptive times.

Data analysis

The data analysis followed a multiple-step approach, in which the emergent theory is constructed iteratively, by moving back and forth between data and analysis (Corbin & Strauss, 1990; Eisenhardt, 1989; Zeithaml et al., 2020). The thinking, conceptualising, theorising and the emerging of concepts, categories and themes are documented in research memos, which represent a “written record of analysis” (Corbin & Strauss, 2015, p. 106). Note that memos are distinct from interview or observation notes in that memos focus on the analytical process and the emergent theory (Corbin & Strauss, 1990). By firmly grounding the analysis in the data, a close linkage of the emergent theory with the data can be pursued (Kyratsis et al., 2017). Importantly, the analysis strategy relies on initial in-vivo coding, that is using participants’ wording for concept definition, allowing for identification of patterns and common meaning across interviews (Corbin & Strauss, 2015).

Figure 3 illustrates the inductive research process that is based on the in-depth literature review. It is, however, distinct from the conceptual paper in Chapter 2.

First-order concepts were developed in the early stages of the research process by exploring the open coding of interview transcripts. These unrefined early first-order concepts were in-vivo interpretations of informants' anamnesis of firm behaviour in disruptive times. Through the process of open coding¹⁰ of interview transcripts, it is possible to arrive at early definitions of emergent concepts. The repeated reading of the transcripts allows for familiarisation with the data and context. The transcribed interview data was anonymised, and relevant data were redacted to maintain full anonymity of the informants. The initial open coding of interview data is exploratory in nature and aims to arrive at descriptive concept definition. The tentative character of the initial concepts calls for a rather dynamic view of those early concepts, that is these early concepts are not static and might change as the research process progresses. Furthermore, the initial concepts may not necessarily be lower-level concepts as they might later manifest as second-order concepts or constructs. The initial concepts might also be dimensions or properties of the emergent concepts. The use of memos is essential, to be able to refer to the initial thoughts accompanying early conceptualisation and interpretation (Corbin & Strauss, 2015). As the research process progresses, the use of constant comparison of emergent concepts with earlier and later data further validates early concepts within- and across interviews.

Second-order concepts were developed and categorised as the research process progressed and the focus was on further clarifying the meaning of first-order concepts and finding conceptual relations between those concepts to define preliminary second-order concepts. Here the focus is on conceptual meaning and thus the relationship among lower-level concepts. While the emergent early concepts become clearer and second-order

¹⁰ Upon importing the transcripts to NVIVO (Release 1.4; QSR International), the coding and analysis was done in the same program. References, codes and coverage statistics were calculated by the program

concepts are developed, an important aspect is the identification of dimensions of concepts, that is how concepts manifest in the data. At this point in the research process, the focus on contextual, that is relational, meaning shifts the focus from individual interviews to constant comparison across interviews. Here, first- and second-order concepts are re-evaluated and their fit across statements is being assessed. Through the constant evaluation of interpretations against data, the emergent concepts gain further validity, i.e., fit with the data. Constant comparison allows for salient questions in the analysis process such as “What is being said or done? Who is doing it? Why?” (Corbin & Strauss, 2015, p. 87). Consequently, early concepts are further validated and emergent categories and refined.

Constructs. The next steps in the analysis process emphasises the contextual and relational meaning of lower- and higher-level concepts to arrive at constructs (Kyratsis et al., 2017). By triangulating the interview data with secondary data, the first- and second-order concepts and constructs gained further validity against the data.

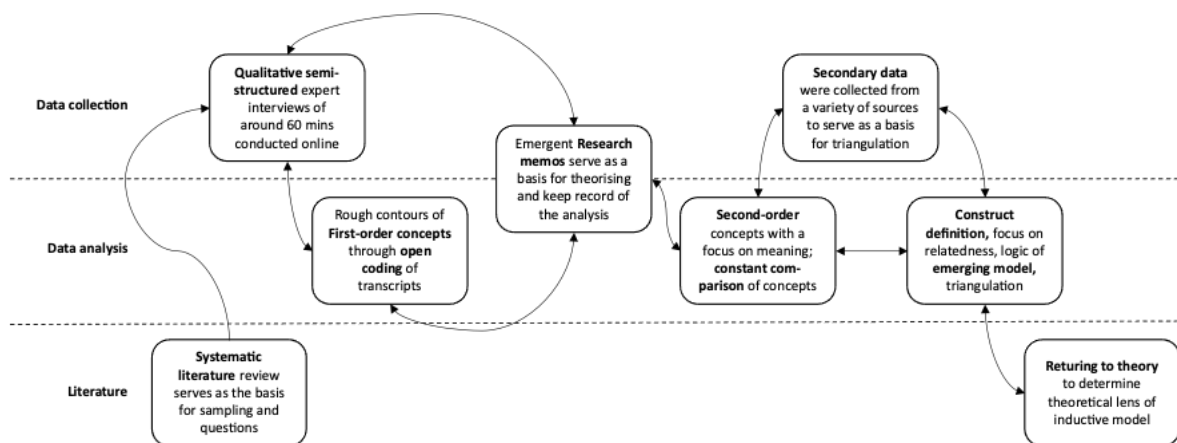


Figure 3 – inductive research process (own illustration) ^{11, 12}

¹¹ The structure of the research process illustrated above is based on ideas published by Harrison & Rouse (2014)

¹² The double-sided arrows represent the bidirectionality and dynamism in the research process. That is, in addition to moving across tasks (collection, analysis, literature), the research process re-iterated at certain steps to ensure optimal fit of the model to the data, thus remain firmly grounded in the data. An overview of exemplary secondary data used for triangulation can be found in Appendix J, Table 23.

The bidirectionality in Figure 3 shall indicate the ability of the researcher to move between data collection and analysis throughout the process. Towards the end of the research process, revisiting the accompanying literature allows the researcher to apply the appropriate theoretical lens to the emergent data structure. That is, while the emergent model gains maturity and theoretical saturation is achieved, the applied theoretical lens allows for explanation of the relational connections within the model.

The result of the research process is discussed in the findings below. Figure 4 gives an overview of the emergent first- and second-order concepts and emerging constructs as well as the conceptual relations within these. These first-, second-order concepts and emerging constructs were modified throughout the research process to increase fit of the emergent model with the data¹³.

Further details on the emerging concepts are given in Appendix G, in tables 14 – 20, where the lower-level concepts are outlined, described and exemplary quotations are added for illustrative purposes. First-, second-order concepts and constructs were revised throughout the research process to better fit the data. Additional secondary data was analysed to *first*, validate initial constructs and relational findings and *second*, to bridge conceptual and relational gaps in the emerging model. Importantly, the conceptual interview transcripts, that are memos, were particularly useful for providing further details on the relationship between concepts and categories as well as supplying ideas for further research avenues.

¹³ A detailed outline of the emergent codebook including files and references as well as explanations can be found in Appendix H. The codebook was exported from NVIVO including all three levels of concepts. Statistics on the number of files and references per code were calculated by the program both in detail and cumulative.

Data structure

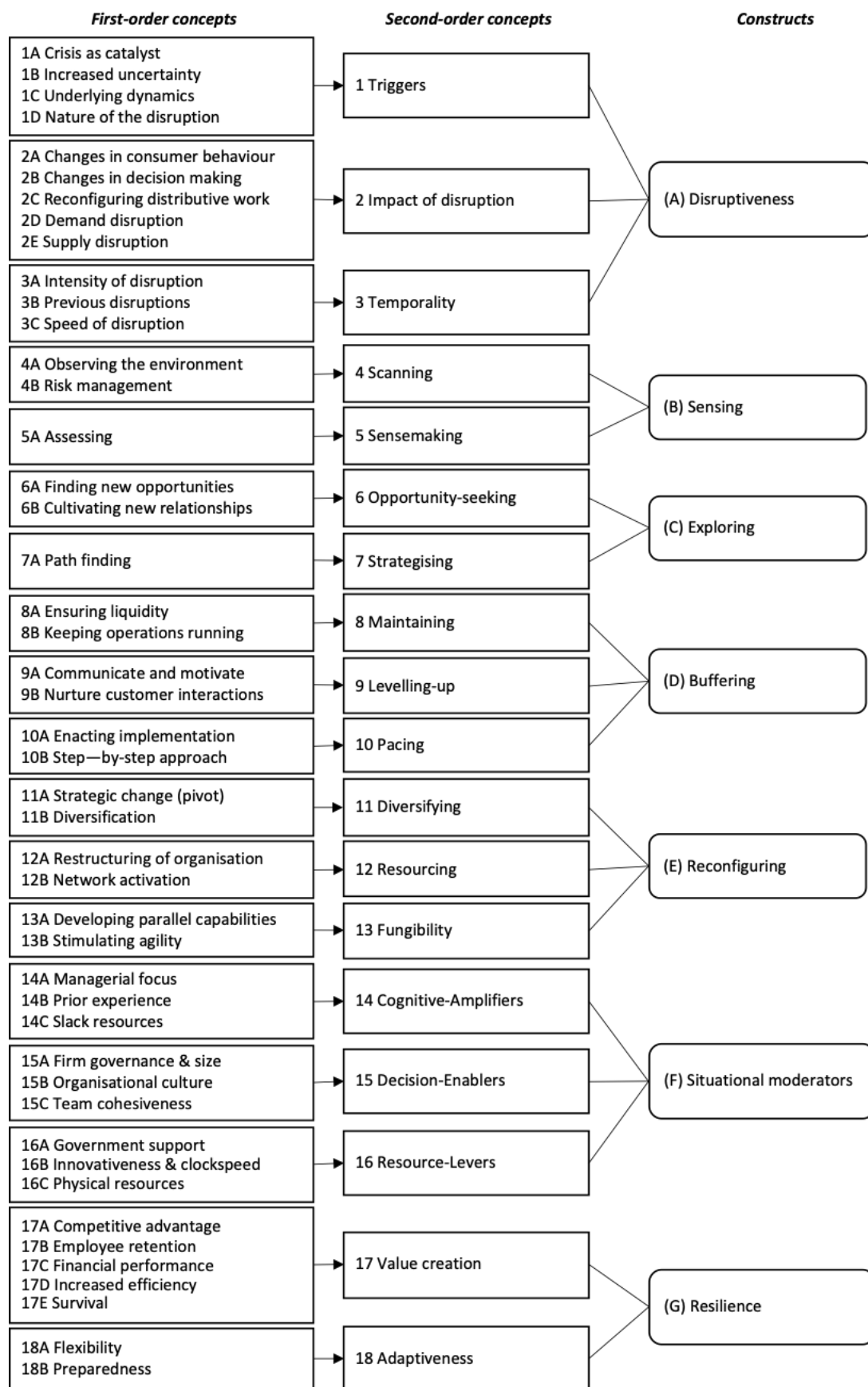


Figure 4 – inductive data structure (own illustration)

Findings

The focus of this analysis was on the characteristics of disruptiveness, firm-level responses to said disruptiveness, the contingent effects of firm-, market- and firm-ecosystem factors and the consequences of firm-level responses. The results from the inductive study allow for a conceptualisation of an emergent model of firm resilience, illustrated in figure 5.

The analysis and interpretation of the data reveal seven main constructs, each explained by a number of underlying dimensions second-order and first-order concepts. The main construct disruptiveness (A) describes the level of disruptiveness by explicating the triggers of disruption, the impact of disruption and the temporality of disruptiveness.

The way how firms formulate and enact responses to the disruptive environmental conditions was categorised in four main constructs. Sensing (B) describes both, the notion of scanning the environment and making sense of signals in the environment. Exploring (C) elucidates firm level activities that relate to the inherently entrepreneurial and explorative concept of purposefully seeking opportunities and strategising in disruptive times. Buffering (D) describes how firms engage in activities of maintaining, levelling-up and pacing to buffer the impact of disruptive dynamics on the firm. Reconfiguring (E), however, accounts for activities that relate to notions of diversification of the firm portfolio, resourcing and fungibility.

The construct summarising situational moderators (F) integrates a variety of contingent aspects endogenous and exogenous to the firm, that impact the formulation and enactment of firm-level responses to yield superior levels of resiliency. Last, the outcome variables are expressed through the construct of resilience (G), summarising aspects of both value creation and adaptiveness of the firm. The emergent model in Figure 5 therefore aims to represent the processes and dynamics that underpin resilience from a contingency perspective.

Disruptiveness (A)¹⁴

Informants detail a variety of aspects that describe the disruptive environment that constitute disruption, including the events that trigger such disruptive dynamics, the impact that disruptive dynamics have on a number of areas and the notion of temporality, which denotes a spatial and temporal view of disruptiveness.

Triggers (1)¹⁵ (Appendix G, Table 14)

Informants draw attention to the role disruptive environments play in accelerating underlying dynamics. That is, dynamics that are not solely induced by the disruptive environment. Concept **1A crisis as catalyst** therefore summarises the role disruptive environments play. One main effect of the disruptive environmental conditions therefore is the acceleration and intensification of dynamics that existed a priori. The pre-existence of these dynamics is an important characteristic, as informants only name very few changes that were induced by the most recent disruptive environmental conditions specifically.

*[T]echnological change is mainly coming from digitalization, of course, and also artificial intelligence [...] and those things, and this is happening faster than it was before course [001]*¹⁶

Informants denote the general tendency of disruptive environments to act as a catalyst for transformative changes.

[I]n each crisis there are certain transformation which take place and which become, let's say structural, not so much temporary behaviour [010]

¹⁴ For reference, the letter in brackets e.g., "(A)" denotes the construct in the data structure

¹⁵ For reference, the number in brackets e.g., "(1)" denotes the second-order concept in the data structure

¹⁶ [001] denotes the informant who made this particular statement, further details in Appendix F, table 12

[T]o accept these changes is a slow process and I believe that before the pandemic we would have continued with this slow adoption little bit at a time. We have to learn now that you got to be in front of it and [...] you can't sit back [011]

An interesting notion is that of the positive effects of the disruptive environment on the firm, in that informants note that the firm is able to focus on strategy formulation as a consequence of the disruptions to both demand and supply.

I actually look at Covid as a very positive disruption. Actually, 'cause it allowed us to actually take stock of where we are. Reflect on who we are as a company, what our core strengths are and where we want to go [005]

One main effect of the disruptive environment is the notion of uncertainty. **1B increased uncertainty** describes the change of levels of uncertainty for firms, manifesting as a variety of dimensions. Uncertainty in demand as a consequence of heightened levels of volatility, uncertainty in supply as a consequence of more volatile supply chains. Uncertainty is for example expressed through employees' reaction to changes.

I'm a firm believer that most people um, are uncomfortable by substantial strategic change. It creates uncertainty [011]

Particularly focal significant seems the notion of uncertainty relative to managerial decision making as one informant notes.

Well, I think uncertainty is probably the one thing that we fear most. 'cause we are like a company like us is not just [company]. There are many companies like us, but you know making changes and yeah you know it. You can't manoeuvre as if you were on the bicycle and decide to turn left or turn right or to go back. Um?

So, we, we hate uncertainty, and the crisis with when it brings initially is uncertainty [021]

It is the increased levels of volatility across various domains within the firm that creates uncertainty and thus managerial decision making is inherently more complex. For example, the uncertainty induced by stark volatility in supply and demand behaviour increases inaccurateness in forecasting and therefore production and supply planning.

Concept **1C underlying dynamics** further details the underlying dynamics that are accelerated and intensified by the disruptive environment and can have both a negative and positive impact on the firm.

I think these dynamics were in place already before. So the faster pace of change changes in the environment of the companies [006]

For example here in this crisis it was obvious that it was a unique opportunity to accelerate digital transformation of the company [010]

And unfortunately for us, it's not the only issue we have. I mean, protectionism hasn't gone away [011]

I'd say another really critical transformation initiative that's taking place across the industry is sustainability [013]

I think they've been aware of several trends before. Talk about digitalization, platforms, web shop solutions in the industry, and we monitor this. And we're all aware that those things are coming and will become more and more prominent and even tools like artificial intelligent in not really works and automation coming with this and better understanding of markets and dynamics and so on [019]

The concept **1D nature of the disruption** describes how the nature of the events and dynamics that induce disruptive environmental conditions differently impact the firm. Noting that experiences with previous disruptive environments were of little help in the current environment.

it didn't help me to foresee anything like the pandemic because this was so different [001]

Informants also offer insights on the differing nature of trigger, i.e., the event or dynamic that induced the disruptive environment.

The trigger was different. This was a health crisis rather than an economic crisis [011]

Analysis shows that informants relate to previous disruptions in assessing the current disruptive environment which may suggest patterns for certain disruptive environments.

The only kind of comparable crisis situation, [...] it was the time of the international financial crisis too [016]

One crises pattern 9/11. And the other the financial crisis [002]

Impact of disruption (2) (Appendix G, Table 14)

The second category of disruptive environmental characteristics describes the impact that the disruptive environment has on the firm, expressed through a variety of issues. **2A changes in consumer behaviour** describes how the disruptive environment affects consumer behaviour and the consequences for the firm thereof. One informant describes the change in speed.

I mean from a product portfolio standpoint and nothing other than the need for urgency. You know that need for change? If so, we were getting a call from a customer back in March saying, you know, I need to build a mould for [product].

Typically this is a 12 week build. I have to build it in 12 days so I need you to deliver [product] to me this afternoon when we might typically take two weeks. So speed is one thing [011].

One informant describes the change in way how consumers purchase differently as a consequence of the disruptive environment.

Before you said you have to look at the watch and you have to feel the touch or luxury cars and like s-class in China is now sold 90% via Internet. Yeah, before it was 20%. So there are certain shifting consumer behaviour and we have to follow this [002]

Informants also describe **(2B) changes in decision making behaviour** more specifically, by for example noting how the role of speed gains importance in disruptive environments.

Speed before perfection is maybe good synonym speed before perfection [003]

One informant is detailing a shift in decision making behaviour by noting how hierarchies change in disruptive times.

I mean, it used to be an incremental shift off hierarchical decision patterns to more democratic to agile to whatever before the pandemic came. Now the pandemic is coming accelerating some of those but also revising actually this democratic decision patterns into a more hierarchical ones simply due to the fact that once your cash is running out you need to make very tough decisions and they cannot ask other people if they're if they're in line with these decisions [006]

A third, very prominent, impact of the disruptive environmental conditions concerns the **(2C) reconfiguring [of] distributive work**, where a shift in how and where firms and employees work is denoted.

I mean the work, the work life is changing dramatically and people are working from home. This was, nobody thought of that a year ago that it's possible at [company] to work 100% from home and now it's widely accepted [001]

So, the main difference was so we could not communicate via personally. We were stuck. We couldn't travel [anymore] [002]

This notion entails a variety of characteristics and effects. The impossibility to travel for example, forced firms to change the way of doing business to a certain extent. Firms, who previously had relied on personal interaction as a means of decision making or new business acquisition, had to change their approach. While informants note negative consequences of these changes in work environment configuration.

You are not able to go and meet the business partners, government agencies, etc on a on a personal basis [014]

Informants also noted positive effects in that firms saw increases in efficiency across the firm portfolio, processes and structures.

And to be honest like I realized then that it doesn't really impact the efficiency of or like the productivity of work [005]

Informants further detail the effect of the disruptive environment on demand, summarised as **2D demand disruption**. Informants outline how the disruptive environment induced a reduction in customer or consumer demand, increased levels of volatility of demand, that is stark differences between peaks and lows.

you know the fluctuation in demand was very important not for very long, but very important. What was the most probably the most difficult thing to handle is uncertainty because we have the drop [021]

While the demand disruption is often viewed negatively, the disruptive environment also dramatically increased demand in certain business areas, not planned and thus disruptive to a certain extent, as one informant outlines sudden increased demand from the packaging sector.

But people still eating [...] You know that people cannot go hungry so that is a part of business that continue [to grow] [023]

Similarly, informants discussed disruptions to the supply side of the firm, that is the supply chain supplying raw materials or products to the firm. Summarised as **2E supply disruption**, informants outlined the consequences of their firms' suppliers not being able to deliver.

essentially what that did for us was really disrupt our supply chain. Because most of the consumables that we buy we purchased from local distributors, but they are actually imported [005]

or the dramatic increase in transportation cost as a consequence of reduction in overall demand and the consequences of work environment reconfiguration.

And there are other phenomen[a], for instance like the [...] incredible increase in transport costs between China, Europe and the US [004]

Temporality (3) (Appendix G, Table 14)

The third category of environmental characteristics describe the notion of temporality, denoting characteristics of the disruptive environment that relate to the intensity, nature and speed of disruption as well as discussing previous disruptions.

3A intensity of disruption describes for example the importance of sequence of events that constitute disruptive environmental conditions.

This was basically one year after the .com bubble burst and this made the crisis even more severe than it was before. I think the crisis wouldn't have been so bad if 9/11 didn't happen [001]

Another dimension of this concept includes the notion of prevalence, that is the spread of the disruptive environmental conditions among the immediate firm-ecosystem, sectors, geographies and societies.

This is really nothing compared to all that because here you have a worldwide general halt of many activities. I mean what we have never seen before was a total grinding to a halt [004]

But some segments, like the aerospace industry, of course, their dramatic changes, and they go beyond what you have normally in the crisis or what we had [019]

Informants also detail how duration and intensity over time of disruptive environmental conditions impact the firm.

Well, I think the Corona Crisis is second to none. So actually, I have never seen so dramatic changes within such a short period of time [017]

The concept **3B Previous disruptions** summarises how informants describe earlier disruptive periods, which also yields an interesting notion of crisis patterns. This might be helpful for an analysis of how firms look at disruptive environments through a perspective of patterns.

two major disruptions apart from this one. This was obviously the global financial crisis in 2009, which was from nature a bit different because it came from the financials side, but from the consequences quite similar and I remember

very well the first of the of the .com bubble in in 2000, so this was also a major disruption [001]

One crises pattern 9/11. And the other the financial crisis [002]

10 years ago, when we had the 2008 2009 crisis, [...] it was totally unexpected, never happened before, and I can tell you that even before [...] economic crisis affecting the chemical industry [...] But this one was unprecedented. Unprecedented demand dropped by 30% at once no pre warning, nothing. We did not see it coming [...] Nobody saw it coming [021]

Another important aspect in the temporality category is **(3C) the speed of disruption**, which relates to the speed or growth of impact as described by informants.

Also, different here was now the speed in which this crisis has spread across the globe. I believe this is something we have not seen before and we had to deal with a lot of different topics in a matter of hours or days to find some quick emergency solutions [003]

Speed of the disruption we had was far quicker than normal [011]

I think this speed how quickly things with changing [019]

Sensing (B)

Informants elaborated on a number of ways in which firms scan the environment for signals that could be threats to the organisation and how they assess and prioritise those signals to enable consequent decision making, i.e., enactment described as buffering. Informants describe the sensing dimension through two main concepts, one is scanning and the other one is sensemaking. The interpretation follows that scanning, that is, sensing signals in the environment through observation and active risk management, without sensemaking might not be advantageous for the firm as it is the making sense of these scanned dynamics that is enabling certain decision-making processes.

Scanning (4) (Appendix G, Table 15)

Scanning details how firms develop and deploy their cognitive abilities to observe the environment, i.e., sense the environment for signals, make sense of those signals and manage risk in the environment of the firm.

4A observing the environment summarises informants' views on how firms observe the environment for potential disruptive dynamics.

I think we have also of this crisis, we have learned that we need to be much more proactive in sensing out possible disruptive technologies or disruptive developments, referring to our business [003]

Informants detail the necessary proactive approach in sensing the environment for signals, suggesting that firms ought to pay active attention to the environment and scan for dynamics that could manifest as disruptive environmental conditions.

I think with any disruption. Your ability to navigate it has a direct correlation in terms of your ability to anticipate it or to see it coming. You know if it arrives on your doorstep at, you know 8:01 in the morning on Monday, then you're in far

worse shape than if you know you saw it coming you know six months before, or you know or the like [013]

One informant outlines one particular way of observing the environment for potential disruptive dynamics as follows.

There is one aspect that comes to my mind. Note that's also helpful and this is something that banks are doing for [...] like adverse scenarios and all this and [...] I think it's something that every company should [...] think about, is stress testing [...] What happens when your customers cannot go into your shop? [...] when you [...] have like 10% less revenue per month, a weaker month? [020]

The concept **4B risk management** outlines the cognitive ability of the firm to manage risk across the firm portfolio by constantly sensing and evaluating dynamics in the environment. Here purposeful risk management is viewed as the assessment of potentially disruptive environmental dynamics and their potential negative consequences.

risk management today and probably even more in crises, risk management is vital. You need to not so much to gamble necessarily about what the future is going to be rather than to have a scenario-based analysis and see in terms of risk. What makes more sense, knowing that nothing is risk free? You cannot be totally be risk adverse, but you need also to manage your risk and to figure out what happens if you make a big mistake. For me this risk management is sometimes more important than the budget per se, is always a budget in your time when everything is volatile [010]

This suggest an important role of risk management – even implies higher importance of risk management than budgetary planning – where it is the risk assessment of decisions that takes precedence in disruptive times. Informants also relate firm size, that is, the implied

availability of resources dedicated towards these functions, to the notion of risk management, where smaller firms might not be able to actively manage risk through dedicated organisational functions and roles.

I know there's companies now that have these risk assessment or risk management or and the you know you with all the money in the world you have people to, especially to do this kind of stuff, but we you know we're two were too small for that. We've been too lean for being able to do things like that [012]

Sensemaking (5) (Appendix G, Table 15)

A related notion is that of **5A Assessing** signals and dynamics in the environment. Informants detail ways how they attempt to create meaning with the information, that is signals or dynamics, they observed in the environment, for example by outlining specific indicators.

looking at raw material prices makes sense that'll maybe understand disruptions, in particular when there is a development what is simply not reflecting real world, what is simply a crazy development [001]

Informants also put emphasis on the sense making ability of the firm to be able to assess dynamics in the environment as persistent trend or temporary disturbance.

Uncertainty is, is it a trend? A do we have to adapt to this trend or is it another hiccup? [021]

Exploring (C)

Exploring relates to inherently entrepreneurial activities and processes within the firm that are dedicated to seeking opportunities on the one hand and strategising on the other hand. Distinct from the abilities summarised as sensing, the explorative dimension of resilience behaviour focusses on the entrepreneurial aspect of firm-level responses to disruptiveness. Exploring considers aspects of purposefully seeking opportunities and the more longer-term focussed capabilities and processes that constitute strategising. A temporal perspective therefore seems important, that is opportunity seeking seems to emphasise the short- and medium-term perspective, while strategising seems to put emphasis on the longer-term building and sustaining of firm-level advantage.

Opportunity-seeking (6) (Appendix G, Table 16)

The idea of purposeful, inherently entrepreneurial, opportunity seeking behaviour that firms engage in, seems to be of particular importance in disruptive times. While firms engage in sensing activities to identify changing and potentially disruptive dynamics in the environment, firms purposefully, and entrepreneurial in spirit, seek opportunities that enable the firm to predominantly reconfigure its asset base, processes and underlying capabilities.

6A finding new opportunities describes how firms engage in active and purposeful entrepreneurial behaviour that produces new business opportunities for the firm. One dimension of this concept is engagement in M&A activities.

I might buy a competitor. It's at out of bankruptcy eventually even, and buy just the machines and the people from the market [006]

Informants outline another dimension of this concept as the redeployment of extant capabilities of the firm to capitalise on new business opportunities arising in the current environment.

What if we got now in types of capabilities that other companies could utilize that may not lie within our normal core area [...] and those can also be used for other things. So, there are a lot of companies out there who are looking for new locations where they could have a company like ours manufacture just [product] but just [product] [008]

Informants also note the importance of business model innovation initiatives as a form of opportunity seeking behaviour.

I would say starting at the last quarter of last year and we are looking intensively into new business models how we could interact our customers with [003]

The concept **6B cultivating new relationships** puts particular focus on exploring new ways of interacting with potential customers and consumers. This was strikingly interesting as the characteristics of the current disruptive environment and the consequences of those, forced firms to especially focus on these activities.

Can we establish a virtual contact which in the end leads to a concrete business?

[...] will we succeed to bring business partners together virtually? [004]

If you are looking for new partners and there is more difficult because you don't always get those sorts of subliminal signals. As is my message coming across or not, it's more difficult when you see somebody meet for the first time on [007]

It works quite well to continue business on the digital format, but very difficult to initiate new business contact [016]

Strategising (7) (Appendix G, Table 16)

Strategising refers to the capabilities and processes that underpin path finding, where the focus is on the long-term strategy of the firm. The fact that informants explicitly mentioned this aspect, represents a rather positive dynamic in disruptive times, in that firms

were able to find time for purposeful strategising. In essence, strategising can be viewed from both an essential as well as opportunistic view. *Essential*, that is the firm is forced to instil strategic change to adapt to the changing environment, *opportunistic*, that is, the firm focusses on future opportunities and how the firm will appropriate superior value in future, not in response to forced adaptation by the disruptive environment.

7A Path finding emerges from informants' emphasis on the ability to strategise in times of disruption, that is, the necessity to (also) focus on formulating corporate strategy by for example changing the firms' value chain position.

Be creative in in in filling gaps which some somebody else left, not necessarily your competitor, but eventually also those guys in line of your value chain before at the end. There will be opportunities which were unthinkable before this pandemic, which might be something which is now on the table, which you might look at and say, well, why not? Let's go that way. Let's extend into the value chain for example or target new markets with new competence, which I have [006]

Interestingly, one informant detailed how the current disruptive environment enabled the firm to strategise and to think about where they can move as a business in a more holistic manner as a consequence of the change in work environment configuration by freeing up resources in the form of both time and managerial attention that can be dedicated towards strategising.

The third thing we did was think take the opportunity to not have to run it around airports and catch trains and airplanes and things to sit down and think in a much more holistic manner. Where can we move the business? [008]

Buffering (D)

Buffering relates to firm-level responses that buffer the impact of disruptiveness on various aspects of the firm. Informants detail how firms buffer by maintaining (ensuring financial, short-term, survival and ability to operate), by levelling-up (bringing various stakeholder groups to the same level during disruptive times) and by pacing (the pacing and timing of steps taken in response to disruptiveness).

Maintaining (8) (Appendix G, Table 17)

As part of the transformative and effectuating aspect of firm-level responses, the category asset efficiency details activities of the firm geared towards achieving an increase in efficiency of existing assets.

The concept **8A ensuring liquidity** summarises aspects of a firms' focus on financial stability in disruptive times. Informants do emphasise the role of excess resources in being able to ensure liquidity of the firm.

I would spend more time in finding those reserve resources which I would need in the case that something goes completely wrong. So, these contingent resources which you need to remain in the position where you can act where you are not forced to react to something which is out of your control [006]

Informants detail a variety of dimensions that firms ought to focus on when aiming to ensure liquidity, that is, financial stability expressed as liquidity risk.

You start immediately to evaluate the short-term risk starting with the liquidity risk. And then be able to survive in the next week in the next month in the next year [010]

A cash flow problem, yeah, so and for. And this is if the case the crisis would put the trigger on longer, but really would become very severe cash flow problem [018]

I think this is at the very heart of at the very centre of your topic is. [...] you know when a company like us is faces rough air, tough conditions Cash is King [021]

The concept **8B keeping operations running** details the way how firms secure their ability to produce and operate.

In the first couple of weeks, it took maybe 70-80% of our time and try to manage this crisis and set countermeasures to counterbalance whatever has to be done quickly keep the operations afloat [...] the focus of the key management team changed to keep the operations going [003]

Analysis suggests that the nature of the disruption impacts this concept, in that firms need to ensure workplace safety and the ability for employees to operate production plants, handle commercial transactions. Also, statements suggest that the structure and focus of the firm impact the way how firms ensure the ability to operate and produce. That is, manufacturing firms with heavy asset position ought to take different decisions differently as for example firms in the professional services sector would need to.

One thing is what are the measures the economic measures not related to the workplace, but the economic measures to be taken to cope with covid. As we've discussed before, there was that question around demand um and um? So we had to make decisions regarding how we manage the purchase of our material, yes. How we manage the level of inventory? How we deal with you know our plant which are flexible but with limited extent very often, so you cannot really adapt [021]

Levelling-up (9) (Appendix G, Table 17)

As the first dimension of asset efficiency-directed firm-level responses, **(9A)** the ability to **communicate and motivate** outlines the firms' abilities to communicate within the firm and with its network of stakeholders as well as the motivational aspect of leadership behaviour done through, for example, facilitation or even enactment of knowledge sharing.

So, we let's say we transfer the plans and the action plans from Singapore or China to 1st Italy. Then we also had it in Germany and also in in the other European countries. And then we also offered this knowledge to our colleagues in North America [002]

Informants also detailed how firms need to put particular emphasis on adapting their way of communicating with stakeholders in their environment.

For the first time, they had to consciously think about it. How do I communicate with my employees? [...] gave a whole new awareness to it. Questions such as information density, information frequency, information scope, high relevance, and these were also addressed accordingly [024]

Another aspect of this concept is the firm-level ability to motivate employees despite disruptive environmental conditions.

The first question I wanted to have answered: How to be ... let's motivate people in terms of how we lead people and what is leadership in times like these. The precise question was like which leadership principles to be apply until we can travel again [002]

Another dimension of asset efficiency-focussed activities is **9B nurture** (existing) **customer interactions**. Informants detail how firms change the way they interact with their current customer base, that is, existing customer relations. The aim of firms is to keep or

enhance the level of intimacy with their existing customers despite the disruptive environment.

Then it comes as well to your intimacy with your customer base. And this can be a key differentiator if you know, uh, the people you do business with is certainly much easier than if you don't know [them] [010]

Informants also infer the advantages of having a geographically diversified firm portfolio, as firms are better able to continue nurturing existing customer relations. Firms do however still have to maintain personal interactions where absolutely necessary, which increases complexity of doing business with current customers.

When I talk to the [country] export managers, they reiterate this experience, they say, oh, we have to come over now. Finally, even though we have to go to quarantine in because we have a number of projects in the pipeline which get stuck. 'cause if you don't do the final how to say negotiating rounds personally your local business partner is very reluctant to sign any contract without final personal business legalization [016]

Pacing (10) (Appendix G, Table 17)

Informants detail how firms buffer by pacing through elaborating on the way how firms enact, that is implement, and how they take a step-by-step approach in adapting to changing environmental conditions. Pacing therefore describes how firms plan changes and adaptations to their resource based by prioritisation and timing.

10A enacting implementation details the way how firms enact changes in disruptive times more generally.

What we typically would do? Would be we would take a few people, 1-2 maybe 3. We would, people we have confidence in. We would challenge them to engage

the organization, the rest of the organization and build followership right and build excitement build followership, build a willingness of people to say I'm prepared to invest in your idea [013]

This concept also elaborates on the way how decision-making behaviour is changing in response to the disruptive environmental conditions.

It's getting more cautious. I think [...] the decision process in itself, and also the realization of those decisions already made, is done in smaller steps [006]

So, he spent a lot of time looking for new systems together is better organized for central filing other protocols that everyone can access them so [007]

How do you? How do you do this in a way that we can handle it? You know something which might normally need a huge plant [008]

An interesting notion is detailed by informants and summarised here as **10B step-by-step approach**. Informants repeatedly outline a temporal and contextual dependence of activities firms take, thereby implying the notion of prioritisation of activities.

I told my team is its first cut [cost], second one is survive and the third point is rebuild [002]

First, our first steps were focused on the health and safety of our employees [...] of course it moves on to business continuity [...] then recovery after August when things started to recover. It was then a case of how do we ramp up our business at the same pace to ensure that we can continue to service our customers. So, there's been different stages [011]

First liquidity and if you if you have enough liquidity and if you know that you can survive then you can think about strategic issues [025]

Reconfiguring (E)

Reconfiguring denotes abilities and processes within the firm that enable redistribution of assets across the firm portfolio, that is, diversifying, resourcing and increasing fungibility of firm assets.

Diversifying (11) (Appendix G, Table 18)

The fourth dimension of firm-level responses is focussed on the transformative and distributive capabilities that firms develop and deploy during times of disruptions. Informants detail the notion of **(11A) strategic change (pivot)** as one of the key elements of the transformative dimension.

I mean I would go as far as to say that we've almost pivoted the company to like a different direction completely [005]

But a lot of revenue generation is downstream of that. So, when you've actually made the product and you're going to the consumer and saying we're selling the product for consumers, there's a very large revenue [008]

let's just take this to the next level and see how we can pivot our business model and actually. Benefit from this situation [020]

One informant in particular notes how these strategic changes or pivots might require changes to the organisational structure, hierarchy or firm portfolio. That is, a shift in value chain position, might require corresponding strategic changes in the organisation.

They had their entire research facilities organized before as a laboratory, now converting into a company that brings in money for the first time yes, they didn't have a product on the market before. That means therefore, you need now a completely different organization [024]

The notion of **(11B) diversification** has been discussed on numerous occasions, emphasising the importance of a firms' ability to diversify across a variety of dimensions, such as geographical diversification

geographic footprint as we are in the position that when China was down, we still have good business in Europe and the United States. And then when the pandemic arrived in Europe and the United States, China already was working like it was before, almost [001]

Informants also emphasised the role of diversification across the dimensions product portfolio, position in the value chain, market segment, customer (size).

You don't want to be dependent on one client. You want to be dependent on a broad range of clients with different requirements [...] if one of them falls off, you still got the others, so that because it's also very important to us when we're looking at metrics is to say that we have not just the number of projects, but the number of different clients involved behind this project [008]

It's also the production process. We operate both upstream in the value chain which is very capital-intensive part of the business and we operate downstream or it's more, let's say batch process much less capital intensive but more labour intensive R&D intensive [010]

I think one big strength of our companies would be very diversified. We operate in a lot of different segments [019]

Resourcing (12) (Appendix G, Table 18)

Resourcing summarises notions of changing the way how firms acquire, retain, deploy and renew resources under disruptiveness, dimensions of which are restructuring and firm- as well as personal-network, that is the individual's personal network, activation.

12A restructuring the organisation describes how firms adapt their organisational structure, hierarchical structure, restructuring of resources and firm portfolio to increase asset efficiency in times of disruption.

streamlining on the one side [...] so we did a lot of restructuring. We closed a lot of locations [002]

I mean we did some rationalization so we closed down several of the offices we have rather reduced the footprint but only not on in a way that the customer sees or recognizes this [019]

Well, some have decided to restructure their personnel too. I mean, in most cases was a reduction in personnel or streamlining, or getting the right people on the right positions [022]

One informant puts additional emphasis on the notion of organisational transformation, that is a combination of firm portfolio, hierarchical structure and other aspects.

how to transform organizations that are historically hierarchical, so this is a difficult process and I think you cannot simply switch the organization from A to B, so turn from 1 to 0. Or the other way around, 0 to 1, is not possible [015]

Another key element of the distributive dimension of firm-level responses is **12B network activation**, summarising informants' insights on the important role of a firms' ability to build, nurture and activate networks.

The knowledge of the of the business community with its suppliers. It's a neighbourhood, it's a [...]. It's in your customers and that's very, very important. And my personal feeling is that in the future it will be even more important than in the past [010]

Further analysis of informants' statements suggests a more nuanced view of the network perspective in that networks are both inside and outside of the firm, both of which seem to be important.

I think you know also is very, very fundamentally driven by connectivity to your organization [...] So I think you have to organize your networks. Both externally and internally to facilitate information flow [...] I think you have to have that that the strong external networks and an intimate internal communication [013]

Fungibility (13) (Appendix G, Table 18)

Fungibility explains activities aimed at increasing or ensuring the fungibility of firm assets, important to the process and dynamics that underpin resilience behaviour of the firm.

The concept **13A developing parallel capabilities** denotes the firms' ability to do activities concurrently that might be contradictory in nature. Informants mentioned a variety of dimensions, such as decision-making behaviour.

So, managing this balance between speed and rationale something critical, and it's up to the management to reassess this [010]

managerial attention focus

You know it's as a as a someone in a leadership position obviously the pandemic has been the primary focus, but it cannot be the only focus of the management and you know you need to still think about the other things that are out there.

The other growth projects that we have underway [011]

strategic focus, i.e., the focus on differing targets

One of the key features of what we did was we need to have a two-fold mind to manage the crisis and prepare the future [...] In fact we as a company we have diversification and consistency, which seems to be a bit counter intuitive [021]

Informants detail how the notion of agility becomes an important aspect of firm-level responses, summarised as **13B stimulating agility**. Agility can be seen as distributive given that the responsibility to make decisions and changes are distributed across the organisation.

So, stimulating agility was one of my major focus. Not necessary because I had to, but making people understand that there is no time so waiting cannot be the easy answer [010]

Stimulating agility can also be seen as inducing distributed decision making

I think it's fair to say that we are a centralized company. And there were a number of decisions that were made by the comex on the basis of you know things being reported to the crisis by this crisis committee. But at the same time there were many, many things decided at the local level because it's impossible. First, I think we have 140 production sites in the world and there is no way a group of eight people can decide on the day-by-day basis where this to being produced for all these plants for the following week and so and so. So it was a real combination of decisions made at the top of a company decision maze at the local level within the business unit [021]

Informants describe agility further as the ability to quickly adapt the organisational structure and processes.

when I say dynamics have, I need very agile organizations, so that you are able to quickly adapt when I notice that something is not working. That is of course from industry to industry different, agile is a stretchable term. That is of course something different than if I am now a brand manufacturer in the field of fashion items or industry, it's completely different, but in both cases of course it's about agility [015]

Situational Moderators (F)

Response formulation and enactment as reaction to disruptiveness is moderated by a number of situational factors, mentioned by informants. Those situational moderators are below clustered in amplifiers (effecting the relationship between disruptiveness and sensing and exploring), integrators (effecting the relationship between sensing, exploring and buffering, reconfiguring) and levers (effecting the relationship between buffering, exploring and resilience outcomes).

Cognitive-Amplifiers (14) (Appendix G, Table 19)

Informants detail the contingent role of **14A managerial focus** in the formulation and enactment of responses to disruptive environmental conditions. One of the key dimensions of managerial focus outlined here is the strategic focus, aptly described by informants.

I think in the second half we came back to what's key management is actually paid for, to look into the future [003]

All of a sudden short-term survival things become very key normally, especially in a big organization [010]

One informant further details a change in managerial focus in disruptive times

We spend time strategizing that maybe more than we did before, even because we have in principle, we have more time now because there's less travel as less [007]

The notion of **(14B) prior experience** has been detailed by informants. One informant notes the important role of prior experience, and learning therefrom, as a reference point for making decisions.

Without a history without a knowledge base, I mean typically 90% of the decisions we make on a day-to-day basis. I believe even probably even higher

than 90% there is a foundation of history to that decision, yeah? When we have a downturn. We know that you gotta look at cost [...] for the first time in our lives, we had a management team of a dozen people who none of us have been through this before [011]

One informant details the reassuring role of prior experience as a reference for disruptive times.

You know it's just the knowledge that however tough things get, that is possible to come out the other side is and experience having done that before is an important component of that for sure [012]

Another view details both the positive and negative consequences of prior experience

It definitely has advantages and disadvantages because if you have prior experience in a crisis you know how to react and you are probably better able to react soon, to react sooner, you probably react stronger because. You know how harmful a crisis can be. Um, and you also probably know which measures can be taken. Yeah. Um? On the other side, I think in this case, as digitalization is a major topic in this crisis, I think that companies that have managers [...], that are younger or are. Um? How should I say this? It's, uh, it's digitalization is. It is a major topic, probably younger managers have more ideas or are more willing to change? [025]

The concept **14C slack resources** summarises informants view of slack resources as contingent factor with a focus on a priori excess resource generation and the consequences of such resources for response formulation.

I would spend more time in in finding those reserve resources which I would need in the case that something goes completely wrong [006]

if you as companies that that were easier to adapt they have a stronger financial base, they had a stronger source of internal funding, so when you have already an established business model, your revenue funded [...] and then of course we ideally also have reserves to like weather a crisis [020]

Decision-Enablers (15) (Appendix G, Table 19)

Decision-Enabling factors impact the relationship between sensing, exploring and buffering, reconfiguring by facilitating better and faster decision-making. That is, through specific firm governance structures, organisational culture and higher levels of team cohesiveness firms are enabled to better integrate the processes and capabilities that underpin sensing and buffering as well as exploring and reconfiguring respectively.

The effect of **firm governance & size (15A)** has been detailed by informants, noting that governance structure, that is privately held vs. publicly listed, or other factors such as board composition, firm size, both the number of employees and size of fixed asset base, hierarchical structures are important dimensions of this concept.

we are a public listed company, so we have to report quarterly figures. So we are not in a position to say OK, so pandemic will last for a year for a year. I don't make any profit and forget everything and after the year OK, we start off again [001]

I mean, financial resources, as you know we are a publicly listed company. Profits from one year distributed, typically to the shareholders. So I think there's no financial resource to be build up for a rainy day [003]

Like we have no obvious hierarchy, we don't have red tape, everything is very casual. So then. The guys who have been with us for a while like understand that flexibility and they have to be adaptable to circumstances [005]

So very hierarchical structures I think are not really useful, for adopting quickly

[019]

Informants further detail the contingent role of the **(15B)** effect of **organisational culture** in disruptive times. Dimensions include cultural distance and the impact of geographical diversity of the firm on organisational culture.

The messages that are differently transported. Yeah, so. And then guy from the United States will transport their sentiment different to, uh, somebody from China, you know that [001]

I think the that's a good example where organizations have to have the facility to recognize when something is important in one portion of the market that they are dealing with right and not compromise their values [013]

Another dimension is the firm-specific culture, as detailed by informants

But it is also a weakness because we don't bring in enough people who want to think differently who want to disrupt our organization when you have a group of people who already think about the way things have always been done, it's hard to change. When you bring people in who think differently, have a different idea, different vision, and give them a voice. Yeah, and then also give them the ability to try it and take a risk. That drives a change in culture, which is quite important [011]

The third dimension of integrating conditional factors is summarised as **15C team cohesiveness**. Informants explain the important role of (top management) team closeness in disruptive times.

I think the dynamic of our management has also changed. We have become closer as a management team. From a communication standpoint from a best practice sharing standpoint from a knowledge management standpoint [011] change in a good way, I would say you know, changing in a way that I think we we're closer basically more objective and in principle actually we're getting more inclusive, than exclusive [023]

Resource-Levers (16) (Appendix G, Table 19)

Firms leverage characteristics of the environment to better be able to achieve resiliency by taking advantage of government support, consumer-led and industry-led innovativeness as well as increased levels of clockspeed and the leveraging effect of physical resources across the firm portfolio.

A number of informants have discussed the contingent role of **(16A) government support**, that is direct financial support as well as indirect strategic support.

Rebound must be seen different because there is a lot of political actions to let's say to minimize the effects of the pandemic on one side and on the other side there is the regional and local, the local performance [002]

A lot of governments came to the party and supported us in quite a few countries, and I believe the same is true in Austria and other European markets [003]

The only support we got entitlements and we got our reduction in rent [007]

If you look at the Singaporean companies, but this was also due to the help from the government is huge transformation process [...] That thing was government.

It was government, giving them incentives, telling them OK. If you in this industry you get a support until the end of the year and by the end of the year if you haven't changed or did anything the financial support is gone [022]

Informants further outlined the important role of **(16B) Innovativeness & clockspeed**, that is the level of (regulatory and innovative) change and market maturity (established vs. emerging) as well as market-led and industry-led innovativeness of the sector. The level of change within the industry can also be viewed as industry clockspeed (Nadkarni & Narayanan, 2007), while innovativeness of the segment can be driven by both the customer and peers within the industry.

OK, obviously biotech is always been inventive and it's always constantly moving, as though someone claiming they've got the next best thing [007]

Generally speaking, at disruption as an act or as a risk or opportunity, yeah, more often than not it's in the emerging spaces. Yeah, competitiveness in the capability by which you manage your business is a good, in my view, at least is where you see the dynamics of change in existing markets. Not to say that disruption can't happen in an existing market. It certainly does. It's just a question of the intensity and frequency [013]

Physical resources (16C) details how a firms' resources impact the achievement of higher levels of resilience. Physical resources concern the number of plants or production sites as well as the scope of these sites. Informants detail how physical resources can impact the firms' behaviour.

We're running round about 140 hundred 30 locations worldwide [001]

140 sites in 40 countries with 30 languages and roughly 5500 people [002]

We have like a small scale GMP manufacturing facility and an R&D lab [005]

If you are more exposed downstream, it's much easier to cut cost because you have smaller plants

Resilience (G)

Denoted as resilience, the focal construct representing the outcome comprises of both the notion of value creation and adaptiveness. It is the level of resilience in comparison with the firms' peers and prior position that is of interest.

Value creation (17) (Appendix G, Table 20)

Informants elaborate on how success in times of disruption can be measured through a variety of lenses. The first of which is **17A competitive advantage**. Dimensions include a change in market position (i.e., market share), stronger company (i.e., competitive advantage has improved), change in business model (e.g., value proposition), strengthened customer relations, sustainability (beyond ecological sustainability).

Did we gain market share? How do we fare against our competitors? We have list of competitors which we always benchmark ourselves against [003]

Expand the services that we offer [...] I think to find a niche in the market. We previously didn't realize that we could capitalize on [it] [005]

Probably if you end up in a stronger market position, whatever this position is defined of, it means if your position in the market has strengthened either because you had a longer breath than your competitors, or you had a better customer relation which you nurtured during this stage [006]

I mean, so the combination between share price and sustainability performance, which includes, by the way, diversity talent management and so on and so forth is part of it, so if you want to be long term successful you need certainly to have a good share price or good valuation, but also to be attractive to people. So people need to think that you're good company to work for [010]

Securing supply chains and market access, and on the other hand, how does it actually look with the people and my own employees [...]and on the other hand, what public expectations are there [024]

The second dimension of the value creation category is **17B employee retention**. Informants outline how employee retention can be a measure of success in disruptive times through attractiveness of the firm for potential employees and criticality of the task environment.

So if you put off your most qualified people, you might not be able to get them back. Once business can be done again, you know if you have as a famous restaurant with the Star Chef and you say to your Star Chef well and your customers come because of him, and if you put off your star chef and when you open again you don't have him anymore, then you might not have the same attractiveness to your clients [004]

We didn't have to like let go of any staff, the fact that we throughout the whole time did not need to reduce anyone's pay [005]

First because he's very skilled workers and you cannot, you know, layoff these people and have to hire them back three months later. It's impossible [021]

Informants also refer to the more obvious notion of **17C financial performance** as measure of success in disruptive times. Statements outlining measures of financial performance. Dimensions include positive financial result (this could be net income, profitability), sales & marketing performance (e.g., new customers acquired) as well as a higher level of adaptiveness of measurement.

I wouldn't say we're in survival mode, so I mean if I look at our business figures, we're actually doing this year better than in the pre covid year [...] another

benchmark is profitability [...] KPIs maybe change going forward you get more and more into new business ideas or different business logic. Maybe some of the KPIs I have mentioned now need also to be revisited [003]

We're just looking at basically how many leads we acquired during this time and how many of those were going to close this actual project [005]

I think we were I mean successful, I think that's been evidenced by we've got new clients or partners, customers [007]

You know I'm very I'd be very simplistic and at the end of the day, especially with public listed company and it will be the share price [010]

The key driver again is cash generation. Who is at the end of the day just for survival standpoint [021]

The fourth dimension of the value creation category was summarised as **17D increased efficiency**. Informants detail how firm-level responses lead to increased efficiency levels across various dimensions including improved cost efficiency, time efficiency, increased efficacy of communication.

But on the other side and I'm gaining a lot of efficiency if I'm sitting at home and doing some kind of [...] without having to travel 4 hours [...] and this positive effects on efficiency [006]

A form of doing export business specifically abroad when it's very time consuming and in the end expensive to travel all the time. Also, the companies have learned a lesson we have seen that certain parts of their business can be done virtually can be done digitally remotely. I think that's the essence [016]

Video conference call is like 1000 times less expensive than then a flight to a certain country. And if one can see OK I have more or less the same outcome or more or less the same result. So why bother stepping into a plane? [017]

Informants further outline the notion of **17E survival** as one of the main success metrics in disruptive times. Survival can be understood as persistence of the firm over time. That is, does the firm still exist after the disruptive environmental conditions have eased.

I think the 1st and important thing is the survival that the company can survive and then tries to make out the best of the situation [004]

One of the biggest problems at the moment so if someone can survive, this is a cash flow problem [017]

Adaptiveness (18) (Appendix G, Table 20)

The second category of how firms measure success in times of disruption is the notion of adaptiveness expressed through flexibility and adaptiveness. Informants detail how success can be measured as a form of **18A flexibility** (implied transformability, ability to act quickly and decisively). Dimensions include structural, strategic and operational flexibility, that is, have these changed over time.

Some changes are improvised and, on the spot, and out of the necessity [004]

Yeah, and that's how you can measure a company how flexibly they are if they will be successful, yes or no [009]

At which speed you can adapt yourself to a situation [010]

And that means during a disruption you must be able to manage without reliable indicators. So there's. Uncertainty in every aspect and even the aspect of how do we know that we're going the right direction? [025]

The second dimension of the adaptiveness category was summarised as a measure of **18B preparedness**. Informants describe the notion of preparedness (i.e., being prepared for changes in the environment and act quickly in accordance). Dimensions include structural (that is for example the organisational structure), financial (that is financial stability, i.e. have enough cash to be able to act in crises) and strategic (e.g., the notion of a diversified portfolio, the notion of sensing and exploring the market) preparedness.

But what would be different now that we would be much better prepared because we have now structures, in place and what every company should have anyhow [...] We would be much better prepared [003]

At the end of the day, it's a very important checking point in the list of things that need to be monitored and better to do it before the crisis and when it's not too late because you cannot change the profile of the company all of a sudden. If you're not prepared the ground, then it's probably hopeless [010]

That you know you have to be ready for even the most crazy circumstance that you could never even think of. Yeah, none of us knew that I knew that you know, 18 months ago that that we would be in in a pandemic and it would affect everything we do [011]

For me resilience is a topic I am prepared and prepared [...] how can I be prepared [...] I deal with the big trend fields to understand where are fields where I need to make preparations? [015]

Sometimes you have hiccups, sometimes you have bumps and having it and it was so in fact the most important things to weather the crisis has been done before [021]

An inductive-contingency-based view of Resilience

The emergent model illustrated in Figure 5 summarises the constructs and underlying dynamics of processes and behaviours that lead to firm resilience. Informants provide useful insights on the complexity and multi-dimensionality of the focal issue. Multi-dimensionality refers to multiple dimensions within constructs and complexity refers to the multi-directionality of the relationships within the model below. Informants predominantly advocate a rather positivistic view of firm-level adaptiveness and value creation under disruptiveness. That is, while firms naturally engage in buffering activities aiming at absorbing and softening the negative consequences of disruptiveness, firms engage in strategising and purposeful opportunity seeking concurrently.

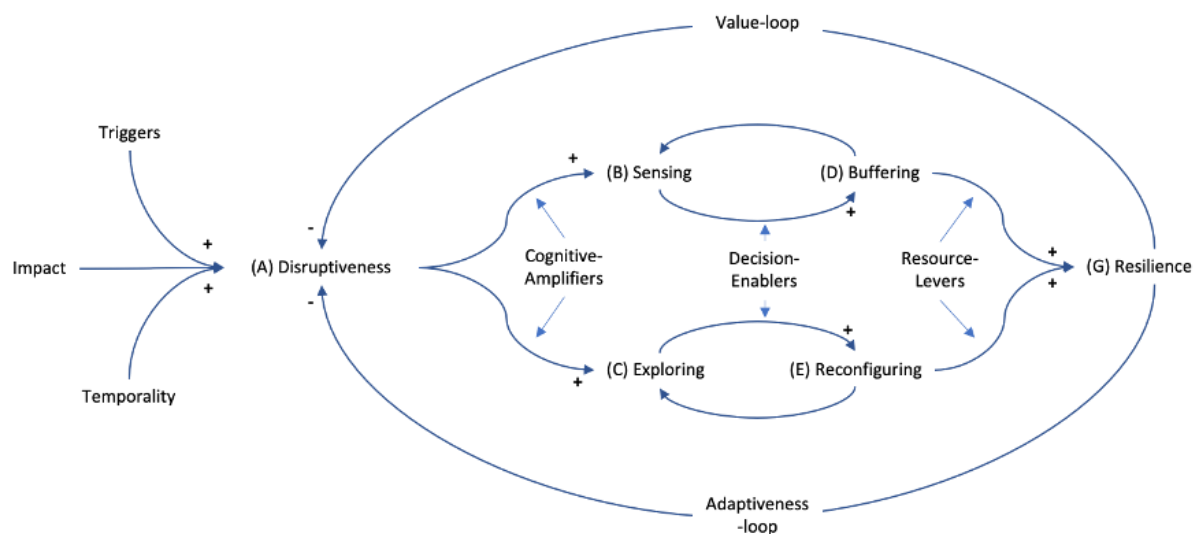


Figure 5 – an inductive-contingency-based model of resilience (own illustration)¹⁷

¹⁷ Arrows indicate the relational direction: the signs “+” and “-” indicate the polarity of the relationship between constructs (Perlow et al., 2002). A “+” sign indicates that an increase in the independent variable causes the dependent variable to increase and that a decrease causes a decrease, that is $X \rightarrow Y \Leftrightarrow \delta Y / \delta X > 0$. A “-” denotes that an increase in the independent variable causes a decrease in the dependent variable and that a decrease causes an increase, modelled as $X \rightarrow Y \Leftrightarrow \delta Y / \delta X < 0$ (Repenning, 2002; Repenning & Sterman, 2002, p. 276; Sterman & Repenning, 1997). Situational moderators, e.g., *cognitive amplifiers*, represent situational moderating effects of variables that amplify, enable or lever, similar to what Repenning & Sterman (2002, p. 277) denoted feedback or reinforcing loops; the effect thereof is denoted by arrows pointing towards the relationships that those moderators impact, e.g., cognitive-amplifiers impact the relationship between disruptiveness and sensing or exploring respectively

These findings lend support to the notion of parallelism and dynamism in the way how firms formulate and enact responses in disruptive times. The emergent model illustrated in Figure 5 summarises the constructs and underlying dynamics. The model suggests that higher levels of disruptiveness give rise to an increase in both sensing and exploring capabilities and processes within the firm. The underlying assumption is, that higher levels of disruptiveness lead to firm-level adaptation as response to changing dynamics. Disruptiveness can be observed through the lens of underlying dimensions, that are, triggers, impact of the disruption and temporality. The greater the change in disruptiveness, the greater the impact on sensing and exploring.

Both, sensing and exploring consequently reinforce notions of buffering and reconfiguring respectively. Those dynamics, however, exist both concurrently and bi-directionally. That is, while sensing reinforces the ability of the firm to buffer, buffering also strengthens the ability and preparedness to scan the environment and make sense of signals and dynamics. Similarly, the inherently entrepreneurial exploring activities strengthen the reconfiguring dimension, which seems to also be true for the inverse relationship. Both, sensing and buffering as well as exploring and reconfiguring enhance firm-level resilience. Sensing and buffering lead to firm-level value creation while exploring and reconfiguring lead to firm-level adaptiveness, yielding the two main dimensions of the resilience construct. That is, the notion of value creation and the concept of firm-level adaptiveness. Whereas the concept of value creation condenses how firms satisfy a variety of stakeholders of the firm through, e.g., superior financial performance and increases in efficiency, the notion of adaptiveness aims to explain how firms foster flexibility and preparedness to increase firm-level adaptiveness. Superior value creation is therefore driven by the ability and firm-level

processes that underpin sensing and buffering, while exploring and reconfiguring lead to higher levels of adaptiveness.

A contingency-based view of resilience is substantiated by informants' emphasis on both the situational moderators and a more nuanced view of environmental conditions that lead to disruptiveness. Informants detail a variety of situational factors that moderate relationships between these constructs. Cognitive amplifiers moderate the relationship between disruptiveness and sensing and exploring respectively. The cognitive-amplifying effects of managerial focus, prior experience with disruptiveness and the impact of slack resources on the anticipatory urgency of disruptiveness are important moderators of the impact of disruptiveness on sensing and exploring. Decision-enablers depict the effect of firm governance and size, organisational culture and team cohesiveness on the relationship between sensing, buffering and exploring, reconfiguring. Decision-enablers facilitate better and faster decision making through, e.g., enhance top management team cohesiveness. The resource-leveraging effect of government support and market-led as well as industry-led innovativeness and the level of change within the industry moderates the relationship between response formulation and enactment and resilience as outcome.

Higher levels of resilience, as measured by the change in value creation and adaptiveness, impact the level of disruptiveness. These relationships are depicted as value-loop and adaptiveness-loop. The value-loop describes how higher levels of performance expressed through superior value creation impacts the level of disruptiveness and therefore the negative impact of disruptiveness on the firm. That is, higher value decreases the negative impact of increased volatility and uncertainty, induced by disruptiveness. Similarly, the adaptiveness-loop depicts how greater levels of adaptiveness, achieved through flexibility and preparedness, impact disruptiveness.

Discussion

While a theory-driven, dynamic capability-view is a useful grounding for explaining how firm-level capabilities ought to be developed, deployed and nurtured to yield superior firm-level resilience, an inductive approach (Chapter 3) to resilience yields an emphasis on the importance of contingent effects of the firm environment, that is, both exogenous and endogenous environmental factors. It follows, when observing the focal phenomenon in managerial practise, an emergent contingency-based view of resilience seems to provide a better and more nuanced understanding of the way how firms formulate and enact responses under disruptiveness contingent upon characteristics of the disruptive environment and situational factors that moderate the relationships between constructs.

Contingency-based view. As advocated in the general contingency theory (Hofer, 1975; Luthans & Stewart, 1977), the optimal managerial response of any given firm is contingent upon a set of situational factors. Contrary to an universalistic view, which was previously related to closed systems thinking, a situational view is related to an open systems thinking (Child, 1974; Luthans & Stewart, 1977). A contingency theoretical view, however, extends the situational view of optimal managerial practises, to form a more exact and rigorous approach by outlining the functional relationships between situational, managerial and performance criteria variables (Luthans & Stewart, 1977, pp. 183–189). The contingent perspective of response formulation and enactment seems useful to form an enhanced understanding of the way how disruptiveness as well as situational moderators impact response formulation. Importantly, assimilating a contingency perspective of firm-level resilience seems to provide an appropriate account of how firms sense, explore, buffer and reconfigure in times of disruption that is firmly grounded in informants' views.

An increased focus on the contingent effects of the firm-environment allows for the appropriation of a more nuanced view of how firms adapt in times of disruption. This extension seems to be of vital importance for an enhanced understanding of how resilience works and to better apprehend how situational, contingent and aspects of disruptiveness trigger, promote and impede the adaptation of the firm to its disruptive environmental conditions. The herein postulated conclusions and emphasis on dimensions of resilience behaviour therefore have to be viewed from a contingent perspective. That is, situational variables mould optimal response formulation of firms. The rather dynamic nature of the model captures the alternating impact of these variables in the environment on the firm.

Dynamism, reciprocity and temporal aspects. The dynamic aspect of the inductive model relates to the fluidity in response formulation and enactment. More precisely, the characteristics that determine disruptiveness of the firm-environment impact the way how firms sense, explore, buffer and reconfigure. Both from a dynamic perspective at the intersection and interaction of the aforementioned activities as well as a *temporal* perspective. *Dynamism* is rooted in the adaptive nature of the relationships between constructs. For example, to be able to buffer a negative impact of disruptiveness, firms need to engage in sensing activities that allow for assessment and categorisation as well as prioritisation of which dynamics a firm needs to buffer at which point in time.

Dynamism moreover relates to the notion of directionality of relationship between constructs. An observation, that is particularly prominent in the *reciprocal* relationship between sensing and buffering, where activities related to buffering can yield important learnings that consequently impact the sensing function of the firm. Similarly, the assumption follows that the way how firms reconfigure informs the way how firms explore through learning from those reconfiguration experiences.

Organisational learning. In consequence, the way how firms formulate and enact responses to disruptiveness yields experiences, the learning from which can improve firm-level processes and capabilities. Organisational learning therefore is a vital component of the dynamic aspect of the inductive model, that is, through learning from experiences firms can improve the way how they respond to disruptiveness. While organisational learning can be seen as a moderating variable, that is, the amount of learning from previous experiences (see the concept 14B prior experiences in Figure 4) within the firm, it can also be viewed as essential feature of the dynamic contingency-based model of resilience outlined in Figure 5. Incremental learning takes place at every step along the process of response formulation and enactment. Importantly, it follows that the learning generated from achieving higher levels of resilience seems to establish a weakening effect on the negative consequences of the disruptiveness, ex ante, that is, in contribution to the adaptiveness-loop outlined in Figure 5.

Capabilities and processes that underpin resilience. Informants clearly outline how firms formulate and enact responses, adapt processes and therefore achieve superior results. While the concepts of sensing and exploring have previously been discussed (see Table 3 above), the buffering function seems to be an important addition to a more holistic, contingency-based, view of resilience. Buffering, that is, the absorption and softening of the negative consequences of disruptiveness through means of maintaining, levelling-up and pacing, seems to be one of the most important activities that constitute firm-level responses. The intensity of the buffering function is contingent upon the contingent effect of environmental and situational variables. Buffering is described by informants through a variety of capabilities and processes. Buffering by maintaining, buffering by levelling-up and buffering by pacing. Interestingly, firms buffer by pacing through planning implementation and taking step-by-step approaches.

Further, the analysis shows that sensing ought to be viewed distinctively from exploring, where sensing activities focus on the potentially disruptive environmental dynamics, that is, a more logical link with buffering. Concurrently, exploring represents an inherently entrepreneurial focus on opportunities, to both, be able to achieve higher levels of adaptiveness as well as medium- to long-term value creation.

Contribution

This paper proposes an inductive-contingency-based view of resilience outlined in this paper, through which it contributes to the received literature in a number of ways. The focus on the firm-environment in a disequilibrium state resharpens the focus of the discussion on managerial adaptation and strategic flexibility under disruptiveness. The dynamism, reciprocity and recursiveness of the relationships between constructs within the model outlined in Figure 5 offers an additional, temporal view of firm behaviour in disruptive times. That is, one shall take a rather longitudinal view of firm-level resilience, warranted to explore the capabilities and process that underpin resilience. Firms view disruptiveness over time and adapt accordingly.

The main contribution of this paper is to propose a contingency-based, temporal, recursive and dynamic model of capabilities, dynamics and processes that underpin firm-level resilience under disruptiveness. The formulation and enactment of firm-level responses were found to be contingent upon both situational factors in the firms' environment as well as the dimensions that constitute disruptiveness. The temporal aspect of the inductive model describes how disruptiveness, capability-development, processes, dynamics and situational moderators evolve over time. Accordingly, adaptation, that is the formulation and enactment of responses, also evolves over time. These aspects of the inductive model inform the firm-level resilience literature by extending a contingency-based view of resilience, that aims to

offer a more nuanced and holistic view how firms survive and outperform under disruptiveness. Consequently, the conceptualisation of the inductive model is represented as procedural model (Perlow et al., 2002; Repenning, 2002) in Figure 5. The construct describing disruptiveness aims to capture the multi-dimensionality of what constitutes disruption in the firm environment, including triggers of disruptive dynamics, the impact of disruptiveness on various aspects of the firm and the temporality of disruptiveness.

The combination of processes, dynamics and capabilities through which firms formulate and enact responses to the disruptive environment yields a more nuanced and holistic understanding of resilience and thus aims to provide a fruitful grounding for further study. The findings of the inductive study also inform literature on organisational learning, that is, as a promoter of the relationships within the model. In other words, each relationship contains notions of organisational learning, that is vital for increased value creation and enhancing firm-level adaptiveness.

Limitations and future research

The inductive study has several limitations. The issue of generalisability of the emergent theory ought to be addressed. While this paper focusses on theory-building through exploratory research, the limitations of the qualitative interview approach and theoretical sampling may pose issues for the generalisability of the emergent theory. Therefore, further quantitative research to extend the validity of the emergent model will be useful and is strongly encouraged. A follow-up study shall test the derived relationships among constructs and the underlying dynamics.

Further, potential issues of endogeneity have to be discussed. The capabilities, processes and dynamics that lead to resilience as outcome, that are, sensing, exploring, buffering and reconfiguring, may themselves be induced by, not only moderated by, other

variables such as prior experience, resource availability or managerial attention focus. Further research, both qualitative and quantitative in nature, could be useful to counter issues of endogeneity in the emergent model.

While this paper proposes a contingency-perspective of firm-level resilience and thereby suggests a disruption-specific view, it seems exceedingly difficult to draw the boundaries to the processes, capabilities and dynamics that are in place in non-disruptive periods. Therefore, further (quantitative) study might reinforce the validity of the emergent model across various research settings.

The interpretation of the interview data yields a rather proactive view of firm-level behaviour, where managerial action is intentional. That is, firm-level behaviour is proactively planned, executed and evaluated in times of disruption to adapt to changing environmental conditions. However, managerial action might be based on intuition, rather than intention. Further study might therefore add clarity.

This study is not free from selection bias in the form of survival bias of the firms and informants sampled. In the context of disruption and resilience, it seems particularly challenging, however, to combat survival bias as one of the main aspects of resilience outcomes is *survival*. While in principle this form of selection bias cannot be entirely avoided, one can sample from the population with the greatest possible care to include polar cases or firms. That is, sampling participants and firms where the emerging theory will likely not hold.

While measures were taken to limit recall bias, this study cannot guarantee to be free from the influences of participants' recollection biases. Further expansion of the sample and quantitative theory testing may increase validity of the emergent theory overall and therewith counter potential biases introduced through the focal sample.

Concluding remarks of the thesis

The scholarly discussion on how firms survive and outperform in times of disruption has been at the centre of academic attention for some time, and, increasingly so in recent years. Particularly, in the current environment, useful guidance is needed for firms to navigate disruptive environments. That is, insightful from an academic point of view and practically relevant from a managerial point of view. This thesis aims to contribute to the ongoing discussion and to extend the literature on firm-level resilience, dynamic capabilities and the contingency-theoretical view of resilience under disruptiveness.

The aim of both proposed views is to provide stimulating insights to how firms survive and outperform in disruptive times. The conceptual dynamic capability view provides useful guidance to the study of how capabilities are developed and nurtured by firms during disruption, while the inductive contingency-based view extends our knowledge of the contingent effect of the firm-environment and the various dimensions of disruptiveness. Therefore, these distinct views provide useful contributions to the respective literatures. In combination, both views may inform academia and managerial practise.

In brief, the conceptual dynamic-capability view of RESCAP extends the resilience literature by informing about the capability dimensions, potential and realised RESCAP, the emphasis on the disequilibrium and by fostering a multi-dimensional view of RESCAP and the disruptive environment. Useful insights that may extend the dynamic capability theory are provided by framing the exploring capacity as a distinct dimension (Chapter 2, Figure 2). The inductive paper extends the resilience literature by providing a contingency-based view that manifests as a fluid, dynamic, recursive model of response formulation and enactment (Chapter 3, Figure 5), providing useful grounding for future research. A summary of findings and limitations specific to both studies is shown in Appendix K and L.

Limitations of the thesis and future research

While the contributions and future research directions are noted in the respective discussion section of each paper, the below limitations of the thesis show a more general view of both limitations and future research directions, as summarised in Table 8. These general limitations shall offer fruitful avenues for further research across a variety of domains and thereby advance a theory of firm-level resilience in the literature that, too, is exceedingly relevant for managerial practise by providing relevant insights across domains and sectors.

While the research process, specifically in Chapter 3, yielded insights in the underlying processes, capabilities and dynamics of creating, nurturing and sustaining firm-level resilience, one ought to consider the limitations to transferability of the findings to other contexts. Therefore, a quantitative follow-up study would be beneficial for theory testing and validity-increasing purposes. The conceptual paper (Chapter 2) aims to provide a useful theoretical framework of RESCAP from a dynamic capability perspective that informs the capability literature. The focus of this paper is to provide a framework, the propositions suggested could be fruitful grounding for further study, where the focus lies in (quantitative) theory testing. Similarly, while the inductive-contingency-based view of firm-level resilience may offer a useful model of firm-resilience under disruptiveness, further theory testing work would enhance the credibility and transferability of this model.

The theoretical sampling process in Chapter 3 focussed on the sampling of polar informants and firms, that is, a focus on instances where the focal theory might be differently applicable or not hold at all. While the intend herein is to create a parsimonious grounding for the contingency-based model, further qualitative and quantitative study of specific sectors will be useful to further carve-out the specificity of the various contingent effects of both disruptiveness and situational moderators in various research settings. It might prove useful

to further investigate how different industries perceive the impact of certain disruptiveness dimensions, or situational moderators differently. For example, the way how prior experience impacts firm survival in a rather *young*, entrepreneurial industry might be different compared with a mature industry segment or ecosystem, where firms hitherto have accumulated vast amounts of prior experience with previous disruptiveness.

While this thesis limits its focus on a strategic management view of firm-level resilience through a dynamic capability and a contingency-theoretical view, scholarly attention could further expand an economics perspective of engendering and appropriating rents. Keyhani et al. (2015) provide a useful view on how firms pursue entrepreneurial rents. This view may prove useful in firm-level resilience research, by informing on how firms pursue which form of rent, or combinations thereof, in times of disruption and thereby informing the micro-economic literature on how firms engender and appropriate rents under disruptiveness.

Additionally, the basic assumption of these studies, that the environments that firms are in are shaped by the tenets of disequilibrium, might be an interesting avenue for future research. That is, taking an economics view of how firms and ecosystems alternate between periods of (dis-)equilibrium, further research may find valuable insights of a temporal aspect of the transition from equilibrium to disequilibrium. This may inform the resilience literature by adding an additional nuance to the procedural and temporal view of how resilience behaviour emerges.

Chapter 3 focusses on the interpretation of informants' views of firm-level resilience. Further study could extend the rational heuristics literature (e.g., Bingham & Eisenhardt, 2011) to conceptualise *simple rules of resilience*. Notions of these heuristics were mentioned by informants detailing the pacing concept, which describes firms taking step-by-step approaches towards firm-level responses in disruptive times. The heuristics literature might

provide an useful perspective to extend this stream of research (Gigerenzer & Gaissmaier, 2010; Luan et al., 2019; Neth et al., 2014; Tversky & Kahneman, 1974). A related area is such of how decision-making processes take place under disruptiveness. While crowded, this research area might be interesting for scholars who want to investigate the ways how firms make decisions when building, nurturing and retaining resilience under constraints.

Further research on the impact of firm governance types, e.g., privately held versus publicly listed firms, might provide an interesting avenue for scholars who are interested in the impact of corporate governance aspects on response formulation and enactment. This follows notions mentioned by informants on how the type of firm governance impacts resiliency, e.g., the concept of firm governance & size (15A).

Research on network effects could further expand on the emphasis that informants have put on the impact of firm-level ecosystem, e.g., network activation (12B). Additional qualitative study might be able to carve out a more detailed view of the effect of network activation and structure on firm-level resilience. Network activation was strongly emphasised by informants to be of particular importance in disruptive times, therefore further insights might inform both the resiliency literature and network literature.

While not mentioned by informants in the empirical study or detailed in the theory paper, characteristics of the TMT may play a particularly salient role when firms formulate and enact responses to disruptiveness. Thus, research on the impact of TMT characteristics and the composition of management boards might yield valuable insights to advance our understanding of firm-level resilience. Findings may inform the corporate governance literature by outlining the specific TMT characteristics of highly resilient firms. Further research on the impact of TMT diversity on firm-level performance and adaptiveness under disruptiveness might be an useful extension of the literature concerning TMT characteristics.

Further study could be aimed at determining specific, distinct, crisis patterns based on the dimensions of the environmental conditions identified in both the conceptual paper as well as the empirical paper. An additional investigation could be based for example in the environmental conditions literature (e.g., Eisingerich et al., 2010; Keats & Hitt, 1988; Sirmon et al., 2007) or the contingency-view of the firm (e.g., Boyd, 1995; Drazin & Van de Ven, 1985; Hoffer, 1975; Luthans & Stewart, 1977). This could expand upon statements made by informants in the empirical study above relating to the detection of crises.

The empirical paper yielded a contingency-based view of how firms formulate and enact responses under disruptiveness. One of the ways firms adopt to these environmental conditions is by buffering. Applying a capability perspective to this dimension of firm adaptation may yield useful insights that extend the literature on dynamic capabilities (Teece et al., 1997) and capability development and lifecycle (Helfat & Peteraf, 2003). Further study may extend the capability literature by forming a more nuanced and finer distinction between other, previously established, dynamic capability dimensions, that are, sensing, seizing and transforming (Teece, 2019), and the emerging buffering dimension. That said, however, one ought to consider the limitations of the empirical study (Chapter 3) and that the buffering dimension had not emerged as a distinct capability, rather as a concept that summarises the processes, dynamics and capabilities firms develop and deploy under disruptiveness to buffer the negative impact of disruptive dynamics (see Appendix G, Table 17).

Considering a longitudinal view of firm-level resilience, further study may explore how resilience response formulation and enactment changes over time. That is, while buffering and exploring arguably are in focus in the earlier stages of disruptiveness, later stages of response formulation and enactment might emphasise behavioural action over cognitive action. However, as the contingency-based view of firm-level resilience advocated in Chapter

3 proposes, the process of formulating and enacting responses in disruptive times may be fluid, dynamic, reciprocal and recursive. While prior scholarship in-part explored the sequential process of organisational resilience based on a capability-view of firm-resilience (e.g., Ducheck, 2020), further study could tease out the temporal dependencies of capability-development and deployment or the procedural aspects of response formulation and enactment more generally. Further investigation could be based in a number of literatures, such as organisational learning (March, 1991) and capability evolution and lifecycle (Helfat, 2000; Helfat & Peteraf, 2003; D. Levinthal & Myatt, 1994). This discussion can be viewed from a variety of perspectives, such as, *one*, the evolution of resilience responses and outcomes longitudinally and, *two*, by viewing resilience as a dynamic capability of the firm and the evolution of such dynamic capability over time.

While the focus of this thesis is on the organisation as the unit of analysis, further study may extend this view and thereby continue earlier thoughts to the level of ecosystem or a more detailed investigation of the processes, capabilities and dynamics that take place on a team-level (Weick, 1993). Extending earlier work on team-level resilience, as opposed to individual-level resilience¹⁸, may for example yield valuable insights for the formulation and enactment of resilience responses on a firm-level. Simply put, the assumption may be that the firm is to some extent the sum of its subsystems, that is, teams, processes and units. This view may therefore also be extended to the firms' sub-units, in other words regional, strategic or product-specific units and teams within the organisation.

¹⁸ A plethora of research has investigated the resilience construct on an individual-level, that is both outside and within the boundaries of an organization. See for example the research on individuals' psychological capital or entrepreneurial resilience in venture formation (Hayward et al., 2010; Hillmann, 2020; Martinelli et al., 2018; Youssef & Luthans, 2007). The focus of this proposed avenue should be on how teams form resilient responses.

Table 8 – general future research directions

Issue	Possible theoretical lens (exemplary studies)	Potential research question
Quantitative theory testing	Either a capability or a contingency perspective	Enhance the transferability of these views to a broader sample of firms across various sectors
Expanding theoretical sampling	Contingency-based view of firm-level resilience	How do firms survive and outperform in a specific sector vs. another sector? How is the impact of specific constructs different?
Economics perspective	Entrepreneurial rents (Keyhani et al., 2015) Economic equilibrium (Frisch, 1936; Kaldor, 1972)	Do firms concurrently pursue Schumpeterian and Kirznerian rents under disruptiveness? How can we determine a shift in equilibrium? How can we identify evolving disequilibrium?
Simple rules of resilience	Rational heuristics (Bingham & Eisenhardt, 2011)	What are the simple rules of resilience that firms adapt under disruptiveness?
Firm governance	Corporate governance (Tirole, 2001; Wright & Siegel, 2021)	How does the governance structure of the firm, impact response formulation and enactment in disruptive times?
Network effects, ecosystem	Network activation, change (Battilana & Casciaro, 2012; Hernandez & Menon, 2021) Social network theory (Eisingerich et al., 2010; Ibarra, 1995; Uzzi, 1997)	How do firms utilise existing networks for resource reconfiguration? How do firms purposefully extend their networks in times of disruption? How does innovation by co-creation strengthen firm-level resilience in disruptive times?
TMT characteristics	TMT diversity (Prahalad & Bettis, 1986) Board composition (Goodstein et al., 1994)	How do TMT characteristics impact firm-level resilience behaviour in disruptive times?
Crisis patterns	Environmental conditions (Keats & Hitt, 1988)	What are distinct patterns of disruptiveness that firms experience?
Buffering	Dynamic capability view (Teece et al., 1997) Capability lifecycle (Helfat & Peteraf, 2003)	Can we establish buffering as a distinct dimension of the dynamic capability framework?
Resilience as an evolvable construct	Organizational Learning (March, 1991) Capability lifecycle (Helfat & Peteraf, 2003)	How do firm responses change over time in context of changing levels of disruptiveness and learning?
Unit of analysis	Ecosystem-level Team-level (Weick, 1993)	How does resilience behaviour manifest on an ecosystem or team level?

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Back matter

Appendix A – list of studies reviewed (Chapter 1)

Table 9 – studies reviewed, by year of publication

#	Study (authors)	Title	Journal / Proceeding / Book	Volume (issue), pages	Source ¹⁹
1	Holling (1973)	Resilience and Stability of Ecological Systems	Annual Review of Ecology and Systematics	4, 1-23	M
2	Staw et al., (1981)	Threat Rigidity Effects in Organizational Behavior: A Multilevel Analysis	Administrative Science Quarterly	26(4), 501-524	M
3	Meyer (1982)	Adapting to Environmental Jolts	Administrative Science Quarterly	27(4), 515-537	M
4	Weick (1993)	The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster	Administrative Science Quarterly	38(4), 628-652	W
5	Holling (1996)	Engineering resilience versus ecological resilience	In: Engineering Within Ecological Constraints	-	M
6	Coutu (2002)	How Resilience Works	Harvard Business Review	80(5), 46–55	W
7	Rudolph & Repenning (2002)	Disaster Dynamics: Understanding the Role of Quantity in Organizational Collapse	Administrative Science Quarterly	47(1), 1–30	W
8	Hamel & Välikangas (2003)	The Quest for Resilience	Harvard Business Review	81(9), 52–63	W
9	Rioli & Savicki (2003)	Information system organizational resilience	Omega	31(3), 227–233	W
10	Sutcliffe & Vogus (2003)	Organizing for Resilience	In: Positive Organizational Scholarship	-	M
11	Bruneau et al. (2003)	A framework to quantitatively assess and enhance the seismic resilience of communities	Earthquake spectra	19(4), 733-752	M
12	Whiteman et al. (2004)	Bringing Feedback and Resilience of High-latitude Ecosystems into the Corporate Boardroom	AMBIO: A Journal of the Human Environment	33(6), 371-376	E
13	Freeman et al. (2004)	The Power of Moral Purpose: Sandler O'Neill & Partners in the Aftermath of September 11th, 2001	Organization Development Journal	22(4), 69-81	M
14	Sheffi & Rice (2005)	A Supply Chain View of the Resilient Enterprise	MIT Sloan Management Review	47(1), 41-48	W
15	Lengnick-Hall & Beck (2005)	Adaptive Fit Versus Robust Transformation: How Organizations Respond to Environmental Change	Journal of Management	31(5), 738-757	W
16	Gittell et al. (2006)	Relationships, Layoffs, and Organizational Resilience: Airline Industry Responses to September 11	The Journal of Applied Behavioral Science	42(3), 300-329	W
17	Youssef & Luthans (2007)	Positive Organizational Behavior in the Workplace: The Impact of Hope, Optimism, and Resilience	Journal of Management	33(5), 774-800	W
18	Donnellan et al. (2007)	Editorial Introduction to the Special Issue on: Transfer and Diffusion of IT for Organizational Resilience	Journal of Information Technology	22(1), 3-4	W
19	Lalonde (2007)	The Potential Contribution of the Field of Organizational Development to Crisis Management	Journal of Contingencies and Crisis Management	15(2), 95-104	E
20	Vogus & Sutcliffe (2007)	Organizational resilience: towards a theory and research agenda	2007 IEEE International Conference on Systems, Man and Cybernetics	3418-3422	M
21	Walch & Merante (2008)	What is the appropriate business continuity management staff size?	Journal of Business Continuity & Emergency Planning	2(3), 240-250	E

¹⁹ source: W = Web of Science, E = EBSCOhost, M = manual addition

Table 9 – Studies reviewed, by year of publication, II (continued)

#	Study (authors)	Title	Journal / Proceeding / Book	Volume (issue), pages	Source
22	Seville et al. (2008)	Organisational resilience: Researching the reality of New Zealand organisations	Journal of Business Continuity & Emergency Planning	2(3), 258-266	E
23	McManus et al. (2008)	Facilitated process for improving organizational resilience	Natural Hazards Review	9(2), 81-90	M
24	Sullivan-Taylor & Wilson (2009)	Managing the Threat of Terrorism in British Travel and Leisure Organizations	Organization Studies	30(2-3), 251-276	W
25	McIndoe (2009)	Decade of Risk	Risk Management	56(10), 22,24,26-27	E
26	Elwood (2009)	Using the disaster crunch/release model in building organisational resilience	Journal of Business Continuity & Emergency Planning	3(3), 241-247	E
27	Somers (2009)	Measuring Resilience Potential: An Adaptive Strategy for Organizational Crisis Planning	Journal of Contingencies and Crisis Management	17(1), 12-23	E
28	Hayward et al. (2010)	Beyond hubris: How highly confident entrepreneurs rebound to venture again	Journal of Business Venturing	25(6), 569-578	W
29	Herbane (2010)	The evolution of business continuity management: A historical review of practices and drivers	Business History	52(6), 978-1002	W
30	Branzei & Abdelnour (2010)	Another day, another dollar: Enterprise resilience under terrorism in developing countries	Journal of International Business Studies	41(5), 804-825	W
31	Gifun & Karydas (2010)	Organizational attributes of Highly Reliable complex systems	Quality and Reliability Engineering International	26(1), 53-62	W
32	Gibson (2010)	An integrated approach to managing disruption-related risk: Life and death in a model community	Journal of Business Continuity & Emergency Planning	4(3), 246-261	E
33	Bhamra et al. (2011)	Resilience: the concept, a literature review and future directions	International Journal of Production Research	49(18), 5375-5393	W
34	Burnard & Bhamra (2011)	Organisational resilience: development of a conceptual framework for organisational responses	International Journal of Production Research	49(18), 5581-5599	W
35	Lengnick-Hall et al. (2011)	Developing a capacity for organizational resilience through strategic human resource management	Human Resource Management Review	21(3), 243-255	W
36	Zobel (2011)	Representing perceived tradeoffs in defining disaster resilience	Decision Support Systems	50(2), 394-403	W
37	Winn et al. (2011)	Impacts from climate change on organizations: a conceptual foundation	Business Strategy and the Environment	20(3), 157-173	W
38	Ates & Bititci (2011)	Change process: a key enabler for building resilient SMEs	International Journal of Production Research	49(18), 5601-5618	W
39	Sullivan-Taylor & Branicki (2011)	Creating resilient SMEs: why one size might not fit all	International Journal of Production Research	49(18), 5565-5579	W
40	Carmeli & Markman (2011)	Capture, governance, and resilience: strategy implications from the history of Rome	Strategic Management Journal	32(3), 322-341	W
41	Chan (2011)	Enhancing organisational resilience: application of viable system model and MCDA in a small Hong Kong company	International Journal of Production Research	49(18), 5545-5563	W
42	Linnenluecke et al. (2012)	Extreme Weather Events and the Critical Importance of Anticipatory Adaptation and Organizational Resilience in Responding to Impacts	Business Strategy and the Environment	21(1), 17-32	W
43	Smallbone et al. (2012)	Small business responses to a major economic downturn: Empirical perspectives from New Zealand and the United Kingdom	International Small Business Journal	30(7), 754-777	W

Table 9 – Studies reviewed, by year of publication, III (continued)

#	Study (authors)	Title	Journal / Proceeding / Book	Volume (issue), pages	Sou- rce
44	Kantur & Iseri-Say (2012)	Organizational resilience: A conceptual integrative framework	Journal of Management and Organization	18(6), 762-773	W
45	Amann & Jaussaud (2012)	Family and non-family business resilience in an economic downturn	Asia Pacific Business Review	18(2), 203-223	W
46	van Trijp et al. (2012)	Quantitative modeling of organizational resilience for Dutch emergency response safety regions	Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability	226, 666-676	W
47	Fleming (2012)	Ensuring Organizational Resilience in Times of Crisis	Journal of Global Business Issues	6(1), 31-34	E
48	Chewning et al. (2013)	Organizational Resilience and Using Information and Communication Technologies to Rebuild Communication Structures	Management Communication Quarterly	27(2), 237-263	W
49	Wicker et al. (2013)	Organizational Resilience of Community Sport Clubs Impacted by Natural Disasters	Journal of Sport Management	27(6), 510-525	W
50	Powley (2013)	The Process and Mechanisms of Organizational Healing	The Journal of Applied Behavioral Science	49(1), 42-68	W
51	Tadić & Aleksić (2013)	Ranking organizational resilience factors in enterprises using a modified fuzzy analytical hierarchy process	Ekonomski horizonti	15(3), 181-196	E
52	Whitman et al. (2013)	Short-form version of the Benchmark Resilience Tool (BRT-53)	Measuring Business Excellence	17(3), 3-14	E
53	Teixeira & Werther (2013)	Resilience: Continuous renewal of competitive advantages	Business Horizons	56(3), 333-342	M
54	Lee et al. (2013)	Developing a tool to measure and compare organizations' resilience	Natural hazards review	14(1), 29-41	M
55	Bullough et al. (2014)	Danger zone entrepreneurs: the importance of resilience and self-efficacy for entrepreneurial intentions	Entrepreneurship Theory and Practice	38(3), 473-499	W
56	Pal et al. (2014)	Antecedents of organizational resilience in economic crises—an empirical study of Swedish textile and clothing SMEs	International Journal of Production Economics	147, 410-428	W
57	Mamouni Limnios et al. (2014)	The Resilience Architecture Framework: Four organizational archetypes	European Management Journal	32(1), 104-116	W
58	Akgün & Keskin (2014)	Organisational resilience capacity and firm product innovativeness and performance	International Journal of Production Research	52(23), 6918-6937	W
59	Gilly et al. (2014)	Resilience of organisations and territories: The role of pivot firms	European Management Journal	32(4), 596-602	W
60	Richtnér & Löfsten (2014)	Managing in turbulence: how the capacity for resilience influences creativity	R&D Management	44(2), 137-151	W
61	Lampel et al. (2014)	Does governance confer organisational resilience? Evidence from UK employee owned businesses	European Management Journal	31(1), 66-72	W
62	Jaaron & Backhouse (2014)	Service organisations resilience through the application of the vanguard method of systems thinking: a case study approach	International Journal of Production Research	52(7), 2026-2041	W
63	Duchek (2014)	Growth in the face of crisis: the role of organizational resilience capabilities	Academy of Management Proceedings		E
64	Ho et al. (2014)	Organizational resilience and the challenge for human resource management	International Conference on Human Resource Management and Professional Development for the Digital Age (HRM&PD) Proceedings		E

Table 9 – Studies reviewed, by year of publication, IV (continued)

#	Study (authors)	Title	Journal / Proceeding / Book	Volume (issue), pages	Source
65	Sahebjamnia et al. (2015)	Integrated business continuity and disaster recovery planning: Towards organizational resilience	European Journal of Operational Research	242(1), 261-273	W
66	Sawalha (2015)	Managing adversity: understanding some dimensions of organizational resilience	Management Research Review	38(4), 346-366	W
67	Mendonça & Wallace (2015)	Factors underlying organizational resilience: The case of electric power restoration in New York City after 11 September 2001	Reliability Engineering & System Safety	141, 83-91	W
68	Valero et al. (2015)	Does transformational leadership build resilient public and nonprofit organizations?	Disaster Prevention and Management	24(1), 4-20	W
69	Mafabi et al. (2015)	Creative climate and organisational resilience: the mediating role of innovation	International Journal of Organizational Analysis	23(4), 564-587	W
70	Cavaco & Machado (2015)	Sustainable competitiveness based on resilience and innovation – an alternative approach	International Journal of Management Science and Engineering Management	10(2), 155-164	W
71	Manfield & Newey (2015)	Escaping the Collapse Trap: Remaining Capable Without Capabilities	Strategic Change	24(4), 373-387	W
72	Management Today (2015)	Why Resilience Is the Key to Success	Management Today	58-61	E
73	van der Vegt et al. (2015)	Managing Risk and Resilience	Academy of Management Journal	58(4), 971-980	E
74	Castellacci (2015)	Institutional Voids or Organizational Resilience? Business Groups, Innovation, and Market Development in Latin America	World Development	70, 43-58	E
75	Ortiz-de-Mandojana & Bansal (2016)	The long-term benefits of organizational resilience through sustainable business practices	Strategic Management Journal	37(8), 1615-1631	W
76	Annarelli & Nonino (2016)	Strategic and operational management of organizational resilience: Current state of research and future directions	Omega	62, 1-18	W
77	De Carvalho et al. (2016)	Organizational resilience: A comparative study between innovative and non-innovative companies based on the financial performance analysis	International Journal of Innovation	4(1), 58-69	W
78	Kolay (2016)	Measurement of Organizational Resilience - An Approach	Productivity	57(3), 300-309	E
79	Kerr (2016)	Organizational Resilience	Quality	55(7), 40-43	E
80	Chen (2016)	Construction of an Early Risk Warning Model of Organizational Resilience: An Empirical Study Based on Samples of R&D Teams	Discrete Dynamics in Nature and Society	2016	E
81	Andrew et al. (2016)	Sources of organisational resiliency during the Thailand floods of 2011: a test of the bonding and bridging hypotheses	Disasters	40(1), 65-84	E
82	Breda (2016)	Building Resilient Human Service Organizations	Human Service Organizations: Management, Leadership & Governance	40(1), 62-73	E
83	Buliga et al. (2016)	Business model innovation and organizational resilience: towards an integrated conceptual framework	Zeitschrift für Betriebswirtschaft; Heidelberg	86(6), 647-670	E

Table 9 – Studies reviewed, by year of publication, V (continued)

#	Study (authors)	Title	Journal / Proceeding / Book	Volume (issue), pages	Source
84	Clément & Rivera (2017)	From Adaptation to Transformation: An Extended Research Agenda for Organizational Resilience to Adversity in the Natural Environment	Organization & Environment	30(4), 346-365	W
85	Teo et al. (2017)	The relational activation of resilience model: How leadership activates resilience in an organizational crisis	Journal of Contingencies and Crisis Management	25(3), 136-147	W
86	Conz et al. (2017)	The resilience strategies of SMEs in mature clusters	Journal of Enterprising Communities	25(3), 136-147	W
87	Gimenez et al. (2017)	Improving the resilience of disaster management organizations through virtual communities of practice: A Delphi study	Journal of Contingencies and Crisis Management	25(3), 160-170	W
88	Dalgaard-Nielsen (2017)	Organizational resilience in national security bureaucracies: Realistic and practicable?	Journal of Contingencies and Crisis Management	25(4), 341-349	W
89	Villemain & Godon (2017)	Toward a resilient organization: The management of unexpected hazard on the polar traverse	Safety Science	95, 210-218	W
90	(Ruiz-Martin et al., 2017)	The application of the viable system model to enhance organizational resilience	In: Advances in Management Engineering		W
91	Tejeiro Koller et al. (2017)	Corporate culture and long-term survival of Spanish innovative firms	International Journal of Innovation Science	9(4), 335-354	W
92	Mzid (2017)	Family Capital and Organizational Resilience of the Family Firm in Tunisia	Contributions to Management Science	41-61	W
93	Blades (2017)	Organisational resilience: What does it mean?	Governance Directions	69(11), 669-671	E
94	Asch & Mulligan (2017)	Organizational Resiliency: The World-Famous San Diego Zoo Way	Leader to Leader	2017(83), 53-58	E
95	Linnenluecke (2017)	Resilience in Business and Management Research: A Review of Influential Publications and a Research Agenda	International Journal of Management Reviews	19(1), 4-30	M
96	Williams et al. (2017)	Organizational Response to Adversity: Fusing Crisis Management and Resilience Research Streams	Academy of Management Annals	11(2), 733-769	M
97	Sahebjamnia et al. (2018)	Building organizational resilience in the face of multiple disruptions	International Journal of Production Economics	197, 63-83	W
98	Korber & McNaughton (2018)	Resilience and entrepreneurship: a systematic literature review	International Journal of Entrepreneurial Behavior & Research	24(7), 1129-1154	W
99	Kahn et al. (2018)	The Geography of Strain: Organizational Resilience As a Function of Intergroup Relations	Academy of Management Review	43(3), 509-529	W
100	Prayag (2018)	Symbiotic relationship or not? Understanding resilience and crisis management in tourism	Tourism Management Perspectives	25, 133-135	W
101	Tisch & Galbreath (2018)	Building organizational resilience through sensemaking: The case of climate change and extreme weather events	Business Strategy and the Environment	27(8), 1197-1208	W
102	Duchek (2018)	Entrepreneurial resilience: a biographical analysis of successful entrepreneurs	International Entrepreneurship and Management Journal	14(2), 429-455	W
103	Burnard et al. (2018)	Building organizational resilience: Four configurations	IEEE transactions on engineering management	65(3), 351-362	W
104	Carlson (2018)	Vigilant resilience: the possibilities for renewal through preparedness	Corporate Communications: An International Journal	23(2), 212-225	W

Table 9 – Studies reviewed, by year of publication, VI (continued)

#	Study (authors)	Title	Journal / Proceeding / Book	Volume (issue), pages	Source
105	Manfield & Newey (2018)	Resilience as an entrepreneurial capability: integrating insights from a cross-disciplinary comparison	International Journal of Entrepreneurial Behavior & Research	24(7), 1155-1180	W
106	Martinelli et al. (2018)	The resilient retail entrepreneur: dynamic capabilities for facing natural disasters	International Journal of Entrepreneurial Behavior & Research	24(7), 1222-1243	W
107	Andersson (2018)	Followership: An Important Social Resource for Organizational Resilience	In: The Resilience Framework: Organizing for Sustained Viability		W
108	Branicki et al. (2018)	How entrepreneurial resilience generates resilient SMEs	International Journal of Entrepreneurial Behavior & Research	24(7), 1244-1263	W
109	Edström (2018)	Business Clusters and Organizational Resilience	In: The Resilience Framework: Organizing for Sustained Viability		W
110	Bouaziz & Smaoui Hachicha (2018)	Strategic human resource management practices and organizational resilience	Journal of Management Development	37(7), 537-551	W
111	Ishak & Williams (2018)	A dynamic model of organizational resilience: adaptive and anchored approaches	Corporate Communications: An International Journal	23(2), 180-196	W
112	Morais-Storz et al. (2018)	Innovation and metamorphosis towards strategic resilience	International Journal of Entrepreneurial Behavior & Research	24(7), 1181-1199	W
113	Tengblad & Oudhuis (2018a)	Conclusions: The Resilience Framework Summarized	In: The Resilience Framework: Organizing for Sustained Viability		W
114	Carden et al. (2018)	Organizational resilience: A look at McDonald's in the fast food industry	Organizational Dynamics	47(1), 25-31	W
115	Gover & Duxbury (2018)	Inside the Onion: Understanding What Enhances and Inhibits Organizational Resilience	The Journal of Applied Behavioral Science	54(4), 477-501	W
116	Sincorá et al. (2018)	Business analytics leveraging resilience in organizational processes	RAUSP Management Journal	53(3), 385-403	W
117	Van Trijp et al. (2018)	Resilience from the real world towards specific organisational resilience in emergency response organisations	International journal of emergency management	14(4), 303-321	W
118	Tengblad (2018c)	Resilient Leadership: Lessons from Three Legendary Business Leaders	In: The Resilience Framework: Organizing for Sustained Viability	89-110	W
119	Verreynne et al. (2018)	Editorial for the special issue on: organizational resilience and the entrepreneurial firm	International Journal of Entrepreneurial Behavior & Research	24(7), 1122-1128	W
120	Tengblad (2018a)	A Resource-Based Model Of Organizational Resilience	In: The Resilience Framework: Organizing for Sustained Viability	39-56	W
121	Jansson (2018)	Financial Resilience: The Role Of Financial Balance, Profitability, And Ownership	In: The Resilience Framework: Organizing for Sustained Viability	111-132	W
122	Tengblad & Oudhuis (2018c)	Organization Resilience: What Makes Companies And Organizations Sustainable?	In: The Resilience Framework: Organizing for Sustained Viability	3-18	W
123	Tengblad (2018b)	Organizational Resilience: Theoretical Framework	In: The Resilience Framework: Organizing for Sustained Viability	19-38	W
124	Eriksson (2018)	Followership For Organizational Resilience In Health Care	In: The Resilience Framework: Organizing for Sustained Viability	163-180	W

Table 9 – Studies reviewed, by year of publication, VII (continued)

#	Study (authors)	Title	Journal / Proceeding / Book	Volume (issue), pages	Source
125	Oudhuis (2018)	Organizational Resilience And Stagnation At A Fashion Company	In: The Resilience Framework: Organizing for Sustained Viability	181-196	W
126	Ma et al. (2018)	Toward a dynamic model of organizational resilience	Nankai Business Review International	9(3), 246-263	W
127	Butler (2018)	Five steps to organisational resilience: Being adaptive and flexible during both normal operations and times of disruption	Journal of Business Continuity & Emergency Planning	12(2), 103-112	E
128	Hillmann et al. (2018)	Educating Future Managers for Developing Resilient Organizations: The Role of Scenario Planning	Journal of Management Education	42(4), 461-495	E
129	Barasa et al. (2018)	What Is Resilience and How Can It Be Nurtured? A Systematic Review of Empirical Literature on Organizational Resilience	International Journal of Health Policy and Management	7(6), 491-503	E
130	Pradhan & Bhattacharyya (2018)	Building organisational resilience: role of cherishing at work	International Journal of Entrepreneurship & Innovation Management	22(3), 269-285	E
131	Collier (2018)	An examination of the impact of diverse internationalization experience on organizational resilience and a test of the Resilience Architecture Framework	Dissertation Auburn University		E
132	Leszczynska (2018)	Mechanisms of Organisational Resilience to Weather Extremes - an Attempt of Identification	International Multidisciplinary Scientific Conference on Social Sciences & Arts SGEM	5, 663-670	E
133	Koronis & Ponis (2018)	Better than before: the resilient organization in crisis mode	Journal of Business Strategy	39(1), 32-42	M
134	DesJardine et al. (2019)	Bouncing Back: Building Resilience Through Social and Environmental Practices in the Context of the 2008 Global Financial Crisis	Journal of Management	45(4), 1434-1460	W
135	Branicki et al. (2019)	Why resilience managers aren't resilient, and what human resource management can do about it	The International Journal of Human Resource Management	30(8), 1261-1286	W
136	Wood et al. (2019)	Quantifying and mapping resilience within large organizations	Omega	87, 117-126	W
137	Mzid et al. (2019)	How does family capital influence the resilience of family firms?	Journal of International Entrepreneurship	17(2), 249-277	W
138	Darkow (2019)	Beyond "bouncing back": Towards an integral, capability-based understanding of organizational resilience	Journal of Contingencies and Crisis Management	27(2), 145-156	W
139	Herbane (2019)	Rethinking organizational resilience and strategic renewal in SMEs	Entrepreneurship & Regional Development	31(5-6), 476-495	W
140	Barton & Kahn (2019)	Group Resilience: The Place and Meaning of Relational Pauses	Organization Studies	40(9), 1409-1429	W
141	Witmer (2019)	Degendering organizational resilience – the Oak and Willow against the wind	Gender in Management: An International Journal	34(6), 510-528	W
142	Andersson et al. (2019)	Building traits for organizational resilience through balancing organizational structures	Scandinavian Journal of Management	35(1), 36-45	W
143	Hsu et al. (2019)	Resilience and risks of cross-border mergers and acquisitions	Multinational Business Review	27(4), 427-450	W
144	Siltaloppi et al. (2019)	In the service of a higher good: Resilience of academics under managerial control	Organization	1-22	W
145	Haase & Eberl (2019)	The Challenges of Routinizing for Building Resilient Startups	Journal of Small Business Management	57(2), 579-597	W

Table 9 – Studies reviewed, by year of publication, VIII (continued)

#	Study (authors)	Title	Journal / Proceeding / Book	Volume (issue), pages	Source
146	Michel-Villarreal et al. (2019)	Evaluating economic resilience for sustainable agri-food systems: The case of Mexico	Strategic Change	28(4), 279-288	W
147	Jilani et al. (2019)	Empirical study on the Antecedents predicting Organizational Resilience of Small and Medium Enterprises in Bangladesh	Journal on Innovation and Sustainability RISUS	10(2), 138-145	W
148	Morales et al. (2019)	Predictors of organizational resilience by factorial analysis	International Journal of Engineering Business Management	11	W
149	Ingram & Bratnicka-Myśliwiec (2019)	Organizational Resilience of Family Businesses	Problemy Zarzadzania	2/2019(82), 186-204	W
150	Turgeon (2019)	Identifying the Leadership Skills Needed to Develop the Competencies to Lead in a Postcrisis Organization: A Delphi Study	Dissertation Brandman University		E
151	Werran (2019)	How resilient are food businesses?	Food & Drink Technology	18, 26-27	E
152	Beuren & dos Santos (2019)	Enabling and coercive management control systems and organizational resilience	Sistemas de controle gerencial habilitantes e coercitivos e resiliência organizacional	30(81), 307-323	E
153	Bang et al. (2019)	Evaluating local vulnerability and organisational resilience to frequent flooding in Africa: the case of Northern Cameroon	Foresight	21(2), 266-284	E
154	Al-Ayed (2019)	The Impact of Strategic Human Resource Management on Organizational Resilience: An Empirical Study on Hospitals	Business: Theory & Practice	20, 179-186	E
155	Carmeli et al. (2020)	Resilience of sustainability-oriented and financially-driven organizations	Business Strategy and the Environment	29(1), 154-169	W
156	Mitsakis (2020)	Human resource development (HRD) resilience: a new 'success element' of organizational resilience?	Human Resource Development International	23(3), 321-328	W
157	Karman (2020)	An examination of factors influencing the application of mechanisms of organizations' resilience to weather extremes	Business Strategy and the Environment	29(1), 276-290	W
158	Cruickshank (2020)	He who defends everything, defends nothing: proactivity in organizational resilience	Transnational Corporations Review	1-11	W
159	Hillmann (2020)	Disciplines of organizational resilience: contributions, critiques, and future research avenues	Review of Managerial Science	1-58	W
160	Senbeto & Hon (2020)s	Market turbulence and service innovation in hospitality: examining the underlying mechanisms of employee and organizational resilience	The Service Industries Journal	1-21	W
161	Santoro et al. (2020)	Searching for resilience: the impact of employee-level and entrepreneur-level resilience on firm performance in small family firms	Small Business Economics	-	W
162	Beech et al. (2020)	In the family way: an exploration of family business resilience	International Journal of Organizational Analysis	28(1), 160-182	W
163	Conz & Magnani (2020)	A dynamic perspective on the resilience of firms: A systematic literature review and a framework for future research	European Management Journal	38(3), 400-412	E
164	Gracey (2020)	Building an organisational resilience maturity framework	Journal of Business Continuity & Emergency Planning	13(4), 313-327	E

Table 9 – Studies reviewed, by year of publication, IX (continued)

#	Study (authors)	Title	Journal / Proceeding / Book	Volume (issue), pages	Source
165	Beuren et al. (2020)	Effects of the Management Control System on Empowerment and Organizational Resilience	Brazilian Business Review (English Edition)	17(2), 211-232	E
166	Filimonau & Coteau (2020)	Tourism resilience in the context of integrated destination and disaster management (DM2)	International Journal of Tourism Research	22(2), 202-222	E
167	Sweya et al. (2020)	Developing a tool to measure the organizational resilience of Tanzania's water supply systems	Global Business and Organizational Excellence	39(2), 6-19	E
168	Duchek (2020)	Organizational resilience: a capability-based conceptualization	Business Research	13(1), 215-246	M

Appendix B – literature review details (Chapter 1)

Table 10 – literature review summary

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Holling (1973)	Ecological systems	“Resilience is the property of the system and persistence or probability of extinction is the result” (p. 17)	Conceptual, modeling	Under uncertainty and profound impact, the persistence of relationships within a system become more important than its behaviour (p. 1)	Among two populations, different trajectories (behaviours) can be observed within the same system (outcome)	Fluctuations in populations towards different states of (in)equilibria	Differentiation between stability and resilience (p. 17); Instability could even result in enhanced resilience (p. 19); domains of attraction and persistence (p. 21)
Staw et al. (1981)	Organisation, group and individual	No formal definition of resilience	Conceptual, modeling	Threat-rigidity effects in response to threats	Under threat, information processing and control vital	Conceptual	Mult-level analysis shows that under threat information and control are restricted
Meyer (1982)	Organisation, Hospitals	“Resiliency occurs when responses create negative feedback loops that absorb jolts’ impacts” (p. 520); time needed to restore prior levels of service (p. 521)	Natural experiment among a group of 19 hospitals	Departure from equilibria through severe environmental jolts; organisations select and interpret stimuli according to theories of action (p. 519)	Environmental jolts trigger a selection of stimuli which then triggers the organisational response (outcome)	Increase in organisational learning; first- and second-order changes (p. 531)	3 phases of adaptation, ideological and strategic variables are better predictors of adaption than are slack resources and organisational structures (p. 534)
Weick (1993)	Minimal organisation	First, retain direct, inverse, relation of structure, meaning; Second, alienation (social ties) rises attentiveness to meaning, which decreases alienation (p. 646)	Observations via statistical reports, statements, court reports, photographs	Loss of cohesion of role structure and organisational sensemaking in the face of a crises by virtue of leadership failures to maintain such structure in the event of crises	Resilience as an indication for the organisations ability to make sense and adapt (capacity)	Bricolage, virtual role system, wisdom and respectful interaction	Four potential sources of resilience making teams “less vulnerable to disruptions of sensemaking; Organisations only have a restricted view of potential challenges arising
Holling (1996)	Systems	Engineering (p. 36) and ecological resilience (p. 38)	Conceptual, modeling	Engineering (focus on maintaining efficiency of functioning) and ecological (maintaining existence of functioning) (p. 33)	Conceptual	Conceptual	Delineation between engineering (maintain, stay within) and ecological resilience (exist, diversify if necessary)

Table 10 – literature review summary II (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Coutu (2002)	Individuals, Organisations	“The skill and the capacity to be robust under conditions of enourmous stress and change” (p. 52)	Conceptual	Three characteristics of resilient individuals: objective view of reality, sensemaking of adversity and the ability to thrive on available resouces	Individual characteristics as the key driver for resilience (capacity)	Characteristics as key determinants of resilience	Under pressure, individuals “regress to their most habituated ways of responding” (p. 53); Three main characteristics;
Rudolph & Repenning (2002)	Organisation	No formal definition	Conceptual, Modeling based on case studies	Organisational resilience contingent upon the novelty and quantity of adverse events	Ongoing stream of non-novel disruptions beyond the tipping point shift the organisation (outcome)	Performance (net inter-ruption reso-lution rate vs. stress	Differentiation between novelty-induced and quantity-induced crises;
Hamel & Välikangas (2003)	Organisation	“the capacity for continuous reconstruction” (p. 55) “the ability to dynamically reinvent business models and strategies as circumstances change” (p. 53)	Conceptual	Proactive view of resilience and the role of the organisation in trends and dynamics that shape the organisation and economy	Dynamically adapt strategy and business models (capacity)	Level of trauma – avoidance of unexpected changes in the organisation	Conceptualisation of strategic resilience; four main challenges to becoming a resilient firm; need for innovative resilience;
Rioli & Savicki (2003)	Organisation, individual	Ability to respond to unexpected events without suffering “extended period of regressive behaviour” (Horne III & Orr, 1998 as cited in Rioli & Savicki, 2003, p. 227); “capitalise on the ability to absorb change continuously” (p. 231)	Conceptual, Modeling	Organisational resilience in information systems settings in economically volatile times	Organisational and individual level antecedents, resilience factors, and consequences (Fig. 1, p. 229) (capacity)	Organisational processes and structures individual differences as sources of protection from disruption	Conceptual integration of organisational (structure and processes) and individual level (appraisal dispositions and coping styles) to foster organisational resilience in information system organisations

Table 10 – literature review summary III (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Sutcliffe & Vogus (2003)	Organisation, Individual	“more specifically (a) the ability to absorb strain and preserve (or improve) functioning despite the presence of adversity (both internal adversity [...] and external adversity [...]), or (b) an ability to recover or bounce back from untoward events” (p. 96)	Conceptual	In the presence of processes that foster enhanced competence, growth and efficacy, resilient responses of the organisation, group or individual (compared with rigid responses) ultimately lead to positive adjustment of the organisation and thereby strengthening such capabilities to yield enhanced future responses to adverse events (i.e. organisational learning)	Resilient response (outcome) as the behaviour (capacity) manifested as broader information processing, loosening of hierarchy controlled decision-making and slack capabilities	Structures and behaviours of the organisation when being faced with adverse obstacles – responses can be rigid or resilient	Reconceptualised view of resilience counters the earlier threat-rigidity view (formulated by Staw et al., 1981); comparing views of resilience from OT perspective (recover and restore) compared with development perspective (rebound, become resourceful and strengthened in the process);
Bruneau et al. (2003)	Communities	“. . . community seismic resilience . . . ability of social units (e.g., organizations, communities) to mitigate hazards . . . and mitigate the effects of future earthquakes” (p. 735)	Conceptual, modeling	Four dimensional view of community resilience: technical, organisational, social and economic	Reduced failure probabilities, reduced consequences from failures, reduced time to recovery (outcome)	Resilience as robustness and rapidity (ends), resourcefulness, redundancy (means)	Resilient community framework in response to natural disasters based on four dimensions; attempted quantification or measurement of community seismic resilience
Freeman et al. (2004)	Organisation, Investment banking	OT proposes that organisations “are not resilient – at least not in the positive sense of being able to respond effectively to catastrophic events” (p. 72) otherwise no formal definition	Case study with 1 firm	Organisation is not resilient ex-ante but moral purpose can foster a resilient behaviour of the organisation ex-post	Moral purpose as main source of resiliency (outcome)	Moral purpose and employee motivation, customer and competitor behaviour, business and structural opportunities	Moral purpose, behavioural factors and opportunities foster positive resilient behaviour of organisation

Table 10 – literature review summary IV (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Whiteman et al. (2004)	Organisation, high-geographical latitude	Resilience from a socio-ecological and ecological perspective; no formal definition of organisational resilience	Conceptual, 3 case studies	Organisations in high-latitude regions must ought to move beyond the economic resilience perspective to socio-ecological view	Stresses to the ecosystem impact organisational resilience (outcome)	The extend to which socio-ecological resilience is integrated	Extension of the organisaitonal resilience view to integrate ecosystem resiliency into governance and organisational structures
Lengnick-Hall & Beck (2005)	Organisation	Resilience capacity is described as “a unique blend of cognitive, behavioral, and contextual properties that increase a firm’s ability to understand its current situation and to develop customized responses that reflect that understanding” (p. 750)	Conceptual	Adaptive fit assumes a return to equilibrium (longer term) whilst robust transformation (consciously temporary) focusses on the constant change of the firm and its environment; different levels of applicability for adaptive fit and robut transformation (p. 740-743, 748)	When firms face uncertainties, resilience capacity (capacity) enables a firm to decide which responses are required, such that the firm decides between adaptive fit and robust transformation	Robust transformation: alterations in control systems, dynamic capabilities; resilience capacity by measuring mindfulness, sensemaking	Extension of extant view of adaptive fit towards a more dynamic view of robust transformation; introduction of resilience capacity operationalised as cognitive, behavioural and contextual resilience (validity for both new constructs is however only proposed, not tested)
Sheffi & Rice (2005)	Organisation, supply chain	“... the ability to bounce back from a disruption.” (p. 41)	Conceptual	Redundancy and flexibility as the main pillars of resilience	The function of the competitive position and the responsiveness of the supply chain	Conceptual	Disruption profile in phases of performance versus time; disruption vulnerability framework (probability versus consequences)
Gittell et al. (2006)	Organisation, impact of the 9/11 attacks on firm performance	Resiliency is referred to as the ability to positively adjust, to bounce back from adverse events and to maintain functions during times of adverse events (p. 303); speed of stock price recovery (p. 308)	Longitudinal study of 10 US airlines, quarterly stock price data between 1987 and 2005	Resilient performance is expected to be positively influenced by financial reserves and the business model, but negatively by lay-offs during the crisis	Resilient performance (outcome) is predicted by level of financial and relational reserves, and thus a viable business model	Speed of stock price recovery measured as current stock price divided by stock price on September 10, 2001	Post-crisis recovery was significantly and negatively related to lay-offs; “relational reserves enable organisations to establish viable business models” (p. 313) and cominatively enable better ex-post performance

Table 10 – literature review summary V (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Youssef & Luthans (2007)	Individual	Resilience described as the ability to recover from both adverse and positive events and developments (p. 778)	2 studies with one 1032 employees from 135 and two 232 employees from 32 US midwestern firms	The impact of positive organisational behaviour capacities (hope, optimism and resilience) on “work-related employee outcomes” (p. 774)	Resilience (capacity, input variable) as one of three criteria determining positive organisational behaviour (POB)	Impact of psychological resource capacities on performance, job satisfaction, work happiness, commitment	Hope seems to more significantly contribute to job-related outcomes than optimism and resilience
Donnellan et al. (2007)	Organisation, Information technology	Following the definition by Coutu (2002)	Conceptual	How information technology innovation can make a firm more resilient	IT innovation as predictor of resilient organisation (outcome)	Level of IT innovation as contributor to resilience	Various streams within the information technology field are reviewed and conceptualised as predictors of resiliency
Lalonde (2007)	Organisation	Resilience as a process that yields adaptive behaviours and capacities (p. 98)	Conceptual	Crisis management lacks specific goals of forming a resilient organisation, organisational development strengthens resilient capacities	Combined crisis management and organisational development (process, input)	Resilience operationalised as combined disciplines enabling skills	Conceptual combination of crisis management (specific events) and organisational development
Vogus & Sutcliffe (2007)	Organisation	“the maintenance of positive adjustment under challenging conditions such that the organization emerges from those conditions strengthened and more resourceful” (p. 3418)	Conceptual, Theory of organisational resilience	Both ongoing strain and exogenous shocks create unstable conditions for organisations, responses to which strengthen the current and future organisation; differentiation between anticipatory and resilient approach towards turbulence	Building recovery and adaptive as well as monitoring capabilities (capacity); resilient organisations constantly test their assumptions (p. 3419)	The level of belief that resilient organisations are imperfect but can become better through learning; latent resources	Resilience as a process (capacity) as well as a capability; Emphasis of slack resources, margin, resource deployment, opportunities and flexibility, organisational learning and the capacities to bounce back from adverse and unexpected events

Table 10 – literature review summary VI (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Walch & Merante (2008)	Organisation	Ability to withstand adversity and “return to productivity within an acceptable amount of time” (p. 240)	Conceptual, Modeling	Resilient responses require a team of highly qualified individuals; Integration of business continuity, disaster recovery and crisis management to define appropriate staffing	Determination of number of business and IT staff necessary for recovery from incident (structure)	Staff size based on structure of organisational systems and infrastructure	Conceptual model of how to calculate appropriate staff size in business and IT team to manage the recovery from incident
Seville et al. (2008)	Country, Organisation	Resilience as “a function of an organisation’s: situation awareness, management of keystone vulnerabilities and adaptive capacity in a complex, dynamic and interconnected environment” (p. 259)	Initial findings from observations from 6-year research programme in New Zealand	Economy view: resilience cannot be achieved by one company alone but only by collaboration	Resilience as the outcome of collaborative and networked efforts (outcome)	Balance, shared vision, overcoming differences, ongoing commitment, organisational culture	Issues cannot be resolved by any one single organisation itself – strong collaboration between firms is suggested
McManus et al. (2008)	(Community) Organisation	“The ability of organizations to keep operating in times of adversity . . .” (p. 81)	Case study with 10 firms in New Zealand	The interconnectedness between resilience of the wider community and the organisations within that create such resilience	Resilience as the outcome of situation awareness, management of keystone vulnerabilities and adaptive capacity	Operational, strategic and managerial as physical, human and process components	Reconceptualisation of resilience (community – organisational perspective); main pillars: situational awareness, management of keystone vulnerabilities and adaptive capacity
Sullivan-Taylor & Wilson (2009)	Organisation	The ability to bounce back after the crisis (p. 254)	6 cased studies with firms from the travel and leisure industry (TLS)	When managers are faced with uncertainty, two concepts can be applied: organisational resilience and institutional perspective	Resilience as the proactive counterpart to the institutional view (process)	Risk assessment in combination with action repertoire	Theories of framing and action differ across organisations and depend on information completeness, prior experience and prioritisation; Managers in aviation take a proactive, resiliency-driven approach

Table 10 – literature review summary VII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
McIndoe (2009)	Organisation	No formal definition	Conceptual	Risk management as a necessary antecedent of the resilient firm	Risk management includes factors of resiliency (process)	Risk management as an indicator for resiliency and continuity	Risk management conceptualised as an antecedent of the resilient firm and business continuity in the face of shocks
Elwood (2009)	Organisation	Ability of an organisation to counter impacts for exogenous shocks to the system	Conceptual, process modeling	The crunch/release model adopted from disaster management applied to organisational resilience; Resilience conceptualised beyond risk management	Identification of trigger events, underlying causes and risk exposure (process)	Identification of risk forces, identification and mitigation of such forces	Organisational crunch/release model enables organisations to assess and enhance their organisational resiliency; three factors of resilience
Somers (2009)	Organisation	Review of various definitions (p. 12-13) but not formal definition for this paper	Case study of municipal public works departments with survey 96 responses	Risk management as the task, resilience as an outcome or pattern (p. 21); Disaster planning based on organisational resilience potential (p. 13-14)	Indirectly measuring resilience as the organisational outcome or pattern (outcome, latent)	Organizational Resilience Potential Scale (ORPS) measure latent resilience values in firm	ORPS scale to measure latent resilience; Organisations that show higher latent resilience potential, are more likely to show adaptive behaviours (p. 13, 17);
Hayward et al. (2010)	Individual (Entrepreneur)	Recovery from failure (p. 573); Emotional (p. 573), cognitive, social (p. 574) and financial resilience (p. 575)	Conceptual, Modeling	Behavioural decision theory, theory of positive emotions and hubris theory; Resilience through failure	Emotional, cognitive, social and financial resilience indirect outcome of overconfidence (outcome, indirect)	Overconfidence as a predictor of subsequent startup success in response to initial failure	Indirect measurement of resilience; conceptual outline of relationship between overconfidence in one's abilities and the startup success of entrepreneurs
Herbane (2010)	Organisation	Recovery from crisis, no formal definition outlined	Conceptual	Business continuity management (BCM) as a form of organisational crisis management; resilience as a meta-institution	Resiliency as an outcome (outcome, characteristic)	Resilience is defined by BCM and crisis management	Determination of drivers that force firms to implement BCM; BCM as a form of crisis management; Resilience as the outcome of such activities

Table 10 – literature review summary VIII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Branzei & Abdelnour (2010)	Organisation, terrorism activities	“Coping skills in the face of unexpected adversity” (p. 806)	Natural experiment with 9000 households 2001-2005	Psychological resilience, enterprise resiliency under terrorism threat; entrepreneurial activities linked with higher levels of risk (p. 809)	Enterprise resilience summarised as household needs and resourcefulness (outcome, input, characteristic)	Enterprise resilience leads to better income on household level	Enterprise is empirically shown to have a positive effect on household income in the face of adversity
Gifun & Karydas (2010)	Organisation	“ability to recover from the manifestation of a threat by way of its ability to respond to an incident” (p. 58)	Case study through a workshop setting with 6 people	Highly Reliable Resilient Organization (HRRO) as an extension and combination of earlier work	Change in HRRO-level (characteristic)	Assessment of vulnerability, prioritisation and correction criteria link	HRRO as a reconceptualised combination of earlier concepts such as High Reliability Organization and Resilient Enterprise
Gibson (2010)	Organisation	“Resilience is thus a product of an organisation’s capabilities interacting with its environment” (p. 247)	Case study, model community extrapolation	Organisational resilience arises from an organisation’s capacity to deal with disturbances (p. 248)	Coping capabilities determine levels of organisational resilience (capabilities)	Organisational and personal attributes and enabling culture	Resilience was enhanced through enhanced organisational and personal attributes, e.g. tolerance to ambiguity (p. 259)
Bhamra et al. (2011)	Organisation, SMEs, Resilience in wider context	“Resilience is [...] related to both the individual and organisational responses to turbulence and discontinuities” (p. 5376)	Conceptual, literature review	Resilience in the SME context	Resilience as a response (capability) and outcome	“Resilience against disruptions to organisations” (p. 5377)	Resistant not equal to resilient; reviewed by perspectives, topics (behaviour, dynamics, capabilities, strategy and performance), methods

Table 10 – literature review summary IX (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Burnard & Bhamra (2011)	Organisation, SMEs, organisational resilience	“resilience resides in both the individual and organisational responses to turbulence and discontinuities. This involves both the ability to withstand systematic discontinuities as well as the capability to adapt to new risk environments” (p. 5583, following e.g. Starr et al. (2003))	Conceptual, modeling	Organisational resilience in the SME context	Organisational resilience as the responses on organisational and individual level to disruptions and turbulence (process)	“The process of linking resoucrs and capabilities to outcomes” (p. 5595)	Propositions for further study; Resilient response framework (p. 5589): Threat detection and activation, response activation, positive or negative adjustment lead to organisational learning
Lengnick-Hall et al. (2011)	Organisation, Individual, HR management	“Organizational resilience is defined here as a firm’s ability to effectively absorb, develop situation-specific responses to, and ultimately engage in transformative activities to capitalize on disruptive surprises that potentially threaten organization survival” (p. 244)	Conceptual	Strategic human resources management as enabler to develop the organisational capacity for resilience (p. 243)	Resilience capacity developed from organisation-level cognitive, behavioural and contextual capabilities (p. 245) (outcome)	HR practices and individual contributions lead to HR policies that in turn increase organisational capacity which leads to desired outcomes	Integration and summary of prior research in organisational resilience; Cognitive, behavioural and contextual dimension of HR system contributions to building resilience capacity (p. 248-249)
Zobel (2011)	Organisation	“the act of rebounding or springing back” (p. 394), a return to normal or improved operations post-event	Conceptual, Modeling	Different views of resilience; Disaster planning, mitigation; resilience triangle (Bruneau et al., 2003) and predicted resilience (Zobel, 2010)	Multi-dimensional disaster resilience concept; adjusted resilience included in decision making (process)	Integration of initial impact, recovery time (triangle) and perception	Extension of disaster resilience concept to include perceptions of the individual about the true resilience, associated loss and recovery

Table 10 – literature review summary X (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Winn et al. (2011)	Organisation	“ability to withstand external harm and to recover from negative external impacts” (p. 168, following e.g. Sheffi & Rice, 2005))	Conceptual	Physical impact from climate change on organisations; massive discontinuous change (MDC)	Resilience as one possible organisational response to MDC (capability)	Capabilities and competences to “survive and thrive under conditions of MDC” (p. 169)	Linkage of socio-ecological and organisational view;
Ates & Bititci (2011)	Organisation, SMEs	“ability to change concerning the future development” (p. 5602); “Organisational resilience is defined as the ability to anticipate key opportunities and events from emerging trends, constantly adapting and changing, rapidly bouncing back from disaster [...]” (p. 5604, following e.g. Coutu (2002); Hamel & Välikangas (2003))	37 case studies with 232 interviews in European SMEs	Change management: how change is managed, and the consequent impact on resilience in the organisation	Resilience as an outcome from appropriate change management (outcome)	Measures of the change management process determine organisational resilience or the content of the change (p. 5607)	Change management perspective: empirical investigation of integration of change management perspective with the resilient organisation as the outcome, and the identification of main drivers of change management processes that impact the building of a resilient organisation (Fig. 5, p. 5614)
Sullivan-Taylor & Branicki (2011)	Organisation, SMEs	RBV perspective (Barney, 1991); “identification of relevant resources and capabilities that enable an organisation to prepare for, and respond to, extreme events” (p. 5567, Hamel & Välikangas (2003))	11 UK SME decision makers over 3 years	SMEs suffer most (p. 5565, following Ingirige et al., 2008, pp.108–109); RBV perspective; Contextual factors relative to firm size	Resilience as an outcome of managerial and policy practises to building resiliency (outcome)	Four-category framework of perceived resilience (Weick & Sutcliffe, 2001)	SMEs show distinct understanding and approach of resiliency;

Table 10 – literature review summary XI (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Carmeli & Markman (2011)	Society, Organisation	“the history of Rome suggests that, all else being equal, organizational resilience is a function of an ongoing, methodical pursuit of capture and governance strategies” (p. 329)	Historical data from 1000 years history of Rome	Capture strategy, governance strategy (p. 324 -329) as well as four supporting tactics: saving power, maintaining a stronhold base, isolating adversaries and creating forward outposts (p. 332)	Resilience as an outcome of the pursuit of capture and govern strategy (outcome)	Integration of capture and govern strategies as well as corresponding tactics	Strategy-tactic framework of capture and govern, the interaction between those and four corresponding tactics to sustain overall resilience; research based on ancient history of Rome
Chan (2011)	Organisation, System-perspective	Summary of various definitions; “how a small enterprise deals with an adverse business environment for survival” (p. 5546)	1 Hong Kong company, 5 subsystems within	Combination of viable system model (VSM, cybernetic strengths and weaknesses) and multi-criteria decision aid (MDCA, systematic approach to determining the most preferred option)	Resilience as an outcome from a combination of VSM and MDCA (outcome)	Diagnose and identify (VSM) leads to options development (MDCA)	Extension of selection of viable options for organisational resilience (p. 5559); Integration of VSM and MCDCA approaches to form an integrative and holistic framework for decision-making
Linnenluecke et al. (2012)	Organisation	“capacity to absob the impact and recover from the occurrence of extreme weather events” (p. 23)	Conceptual, modeling	Combination of anticipatory adaptation (p. 20) and resilience (p. 21-22) to counter the impact of extreme weather conditions on the organisation;	Resilience (capacities) in combination with adaptative responses	Anticipatory (past experiences) – impact of current event – potential future exporsure	First to produce five step integrative framework of anticipatory adaptation and organisational resilience; prioritisation of resiliency over crisis management view (p. 21)

Table 10 – literature review summary XII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Smallbone et al. (2012)	Organisation, Small businesses	“firm ability to respond to changes in the external environment in order to retain competitive advantage” (p. 761)	Survey responses UK (n = 343) and NZ (n = 1438) in 2009	Small firm responses to economic downturns (p. 754)	Resiliency as one of two outcomes from firms’ responses to downturn (p. 761) (outcome)	Business performance measured as vulnerability vs. resilience	NZ firms seem more reliant on self-financing; particularly financial positions seem to be important for resilience; impact of government policy measures observed; small firms show high levels of adaptability and flexibility
Kantur & Iseri-Say (2012)	Organisation, Individual	“This conceptualization of resilience emphasizes organization’s capable sub-systems, members and resources that are organized to be able to resist and survive against sudden or predictive shocks and adversity in a timely manner” (p. 770)	Conceptual, modeling	Integration of perpetual stance, contextual integrity, strategic capacity and strategic acting to form organisational resilience, which serves as an input variable for organisational evolvability (p. 765)	Resilience as the mediating variable between input variables and output variable organisational evolvability (characteristic, mediator)	Resilience conceptually operationalised as robustness, redundancy, resourcefulness and rapidity	Evolvability, not resilience, is the ultimate aim of the organisation; Superior performance is not automatically guaranteed, the transformation however may yield it (p. 770); Contrasting an action and innovation based view, better sensing capabilities (p. 770) is assumed
Amann & Jaussaud (2012)	Organisation, family firm	“ability to take situation-specific, robust and transformative actions when it confronts unexpected and powerful events that have the potential to jeopardize its long-term survival” (p. 207, following Lengnick-Hall & Beck, 2009))	98 matched-pairs of Japanese family and non-family firms in 1997	Family firms perform better than non-family businesses (p. 205); thus family businesses should show stronger resilience during and after a crisis	Resilience as a relation between crisis planning and adaptive behaviour (outcome, indirect)	Performance, financial structure; resilience: facing down reality, search for meaning, ritualised ingenuity (p. 207)	Family businesses do indeed perform better during and after a crisis and show stronger financial structures over time

Table 10 – literature review summary XIII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
van Trijp et al. (2012)	Safety region (network of organisations)	Operational resilience: ability of an organisation to prevent disruptions and being able to quickly respond to and recover from a disruption to operational processes (p. 668)	84 survey responses among safety stakeholders across Dutch safety regions, modeling	Resilience described as operational resilience to prevent disruptions to the operational processes and recover quickly if necessary	Dynamic operational resilience factor as a decision support tool to optimise resilience (p. 674) (process)	Via dynamic operational resilience factor	Resilience of emergency response organisations described via operational resilience factor; dynamic operational resilience factor variable; unique measures per safety region
Fleming (2012)	Organisation	Ability to spring back from unexpected events; the role of resilience in determining the future state is important (p. 33)	Conceptual	Incorporating strategic management, risk and crisis management	Resilience as a determinant of current survival and future success (characteristic)	Proactive use of strategic management, risk and crisis management	Conceptual integration of three concepts to ensure current survival and future prosperity
Chewning et al. (2013)	Organisation	“. . . ability of the affected parties to communicate and reorganize across periods of rapid change or chaos” (p. 239)	53 in-depth interviews in various sectors in New Orleans	ICT and resilience literature: the use of information and communication technology (ICT) supporting recovery post crisis	Resilience as an outcome as well as behaviours (outcome, behaviour)	Active information sharing, (re)connection and resource acquisition	Highlighted importance of connectivity, adaptability and redundancy; added dimension of resilience: external availability (p. 256)
Wicker et al. (2013)	Organisation, community sports clubs	Function of robustness, redundancy, resourcefulness and rapidity (p. 512)	200 survey responses from community sports clubs in Australia	Concept of organisational resilience applied to community sports clubs facing natural disasters	Resiliency as one input variable to overall organisation recovery (input variable)	Robustness, redundancy, resourcefulness and rapidity (Bruneau et al., 2003)	Human and financial resources mainly used; Resilience, members and use of grants were significantly positively related to overall recovery (Table 4, p. 520)
Powley (2013)	Organisation	Following Sutcliffe & Vogus (2003); “healing involves immediate repair and subsequent strengthening” (p. 43, following Powley & Piderit (2008))	Conceptual	Organisational healing, subsuming resilience, coping or recovery, “enables greater organizational strength” (p. 62); Post traumatic growth literature (PTG)	Healing conceptualised as a combination of resilience and growth (input variable)	Return to normal routines and performance growth through strength (p. 62)	Organisational healing integrates resilience and PTG views to foster return to performance and growth (p. 62)

Table 10 – literature review summary XIV (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Tadić & Aleksić (2013)	Organisation, SMEs	Various definitions reviewed (p. 187)	Conceptual, mathematical modeling (extent analysis)	The first step to specify resiliency enhancement strategies is the prioritisation of organisational resilience factors (ORFs)	Resilience is estimated through assessments and prioritisation of individual business processes and estimation of ORFs (static appraisal, outcome)	ORFs and business process assessment	Identification of relevant business processes and ORFs for process industry SMEs; employment of fuzzy sets theory; aggregation of team to group level; ranking of ORFs relative to combined priorities index; ranking enables learning (p. 196)
Whitman et al., (2013)	Organisation	“behavioural traits and perceptions linked to the organisation’s ability to plan for, respond to and recover from emergencies and crises” (p. 3)	3 datasets used for the approximation	The benchmark resilience tool BRT-53 is a survey-based four-point Likert-scale questions tool that assesses the organisations’ agreement with individual statements of various resilience factors (p. 4)	Organisation-level resilience as indicator of ability to plan for and recover from crises (characteristic, outcome)	BRT-53 (constrained by 13 factors) and its abbreviated versions BRT-13A and BRT-13B	Establishment of abbreviated forms of BRT-53: BRT-13A and BRT-13B whereas BRT-13B shows slightly higher Cronbach’s α thus should be preferred moving forward
Teixeira & Werther (2013)	Organisation	“An organization that adapts anticipatorily and repeatedly can be called resilient.”	50 companies over 60 year period	Competitive advantage is achieved through a firm culture that enables continuous re-creation of competitive advantage based on innovation; anticipatory innovation as the key driving force of competitive advantage	Resilience is achieved through the way and process of firms managing innovation (continuous innovation as capability, resilience as outcome)	The level and frequency of constant renewal creates the competitive edge and hence the resilience (p. 341)	The authors somewhat place the sustained competitive advantage in the same dimension with resilience; adaptive innovation enables the achievement of competitive advantage and as such forms a resilient firm
Lee et al. (2013)	Community, organisation	“. . . ability to plan for, respond to, and recover from emergencies and crises.” (p. 29)	249 individuals in 68 organisations across 13 sectors	Community resilience is built through organisational resilience; resilience linked with competitive advantage	Resilience as a function of adaptive capacity and planning (p. 35) (outcome)	Adaptive capacity and planning (Table 4, p. 34)	Reconceptualised model of organisational resilience comprising of two main factors (adaptive capacity, planning capability)

Table 10 – literature review summary XV (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Bullough et al. (2014)	Individual (entrepreneur)	“an ability to go on with life, or to continue living a purposeful life, after hardship or adversity” (p. 478, as cited in Tedeschi & Calhoun (2004))	Survey of 272 Afghan male and female working community members	Entrepreneurial intentions are influenced by perceived danger on the one and entrepreneurial self-efficacy on the other hand, such relation is theorised to be moderated by resiliency	Resilience as input variable (H2) as well as moderator variable (H3) with entrepreneurial intentions being the DV (p. 476) (input and moderator variable)	Entrepreneurial intentions, perceived threat scale (p. 483), self-efficacy (p. 484) and resilience as brief resilience coping scale (Sinclair & Wallston, 2004)	Resilience is shown to have a marginally significant impact on the the relation between perceived danger and entrepreneurial intentions (H3); significant positive impact can be observed of resilience on intentions (H2) as well as on the interaction between self-efficacy and intention (H4)
Pal et al. (2014)	Organisation, SMEs	SME resilience framework (Fig. 2, p. 412): resilience is the outcome of resourcefulness, dynamic competitiveness, learning and culture in combination	Case study with 20 SMEs	Economic resilience as the outcome, various antecedents are investigated; underlying patterns of antecedents are being conceptualised	Resilience as the outcome specified through a number of antecedents (outcome, specified antecedents)	Antecedents: assets and resourcefulness, dynamic competitiveness, learning and culture (p. 412)	Resourcefulness and dynamic competitiveness seem to be direct key enablers for both resilience and financial performance; learning and culture seem to be indirectly related to resilience
Mamouni et al. (2014)	Framework, Organisation	“the magnitude of disturbance the system can tolerate and still persist” (p. 104, following Holling & Gunderson (2001))	Conceptual	Resilience can be both a desirable and an undesirable state – integrative view of rigidity, dyanmic capabilities and ambidexterity	Organisational resilience assessed through two dimensions: magnitude (the system’s resilience) and desirability (of the system state by e.g. stakeholders) (outcome, framework)	Resilience (y-axes), desirability (x-axes); transience, vulnerability, rigidity and adaptability quadrants	Resilience architecture framework (RAF) operationalised as magnitude of resilience compared with desirability of system-state by stakeholders (Fig. 1, p. 109)

Table 10 – literature review summary XVI (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Akgün & Keskin (2014)	Organisation, individual	“a firm’s ability to effectively absorb, develop situation-specific responses to, and ultimately engage in transformative activities to capitalise on disruptive surprises that potentially threaten organisation survival” (p. 6919, as cited in Lengnick-Hall et al. (2011, p. 244))	112 Turkish firms, 224 surveys in firms with frequent product innovation and exploitation of new technologies	Product innovation and organisational resilience: new and better products enable the organisation to take a proactive approach to resilience; resilience capacity (Lengnick-Hall et al., 2011)	Organisational resilience as cognitive, behavioural and contextual resilience capability (capabilities)	Resilience capacity variables: competence orientation, deep social capital, unscripted agility, practical habits, behavioural preparedness, broad resource network (p. 6924)	Competence orientation and unscripted agility enables better and faster new product development; environmental turbulence influences the relationship between resilience capacity and product innovativeness (Table 5, p. 6927)
Gilly et al. (2014)	Organisation, territories (regions), pivot firms	“resilience as a response to an external shock” (p. 596)	Conceptual	Maintaining high levels of innovation whilst adapting to changing environment and turbulence; double capacity view of resilience viz. resistance to adversity and adaptation	Resilience based on two dimensions: organisational and territorial dimension (outcome)	Territorial: materialise common problem, compromises, joint learning;	Two forms of crises: radical crises and incremental changes; Conceptualisation of territorial resilience (p. 599); resilience operationalised in two dimensions; pivot firm key to linking dimensions (p. 601)
Richtnér & Löfsten (2014)	Organisation	Resilience capacity (not the realised capabilities): “Resilience is a metaphoric notion and refers to the maintenance of positive adjustment under challenging conditions” (p. 150)	Qualitative pre-study with 1 case study, main study with 99 survey responses	Integration of organisational resilience and creativity lenses; firms need to develop capacity for resilience to enable creativity in the organisation	Resilience as the antecedent for organisational creativity in turbulent times (antecedent, capacity, input) (Fig. 1, p. 141)	Structural, cognitive, relational, and emotional resources create capacity for resilience (p. 140)	Case study on 4 resources for resilient capacity development (Appendix, Table A, p. 149); in addition to structural resources (p. 140), strong emphasis on cognitive and emotional resources is necessary

Table 10 – literature review summary XVII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Lampel et al. (2014)	Governance forms, organisation	“Resilience is clearly a desirable property”, “In effect, latent resilience is an emergent property created as a byproduct of what the organization needs to do to function normally” (p. 67); no formal definition	Secondary data on 204 non-EOBs and 49 EOBs from 2004-2009; survey data from 41 EOBs and 22 non-EOBs	Relationship between organisational resilience and alternative firm governance forms (e.g. Employee-Owned-Business, short EOB); added notion of external factors (non-family firm i.e. corporate governance) that contribute to organisational resilience	Resilience built through variations of governance forms and characteristics (outcome)	Resilience measured through performance data (e.g. increase in sales turnover) and resilience factors	Combination of employee stock ownership and employee involvement in governance to build a priori resilience; longer payback horizons and pioneering innovations in EOBs seem to foster more resilient organisational responses
Jaaron & Backhouse (2014)	Organisation, service sector	“ability of an organisation to adapt to the requirements of the surrounding environment and being able to effectively develop new capabilities to absorb and manage environmental variability” (p. 2028, following e.g. Coutu (2002); Hamel & Välikangas (2003))	2 case studies in UK service organisations (Vanguard delivery method)	Integration of individual level attributes and organisational processes that build resiliency	Resilience as the outcome of the application of the vanguard method of systems thinking (outcome)	Organically structured organisation and affective of core employees	Through application of the Vanguard-method the integration of organisational and individual level determinants of organisaitonal resilience was achieved: organically structured organisations and highly affectively committed core employees enable higher resiliency
Duchek (2014)	Organisation	“ability [...] to anticipate trends and potential threats, to cope effectively with unexpected events and to learn from these events to produce a dynamic capability that is directed toward facilitating organizational change” (p. 2)	Conceptual	Capability based view of resilience, contrasting earlier views of resilience as outcome or mere capacities; across different time horizons	Three dimensional resilience as capabilities formed through reactive, current and proactive actions (capabilities)	Anticipation (proactive), coping (current) and adaptation (reactive) capabilities	Integration of two research streams (reactions to unplanned events and high-reliability organisations); formulation of capability-based view with three dimensions

Table 10 – literature review summary XVIII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Ho et al. (2014)	Organisation, Individual	Literature review of resilience concept relative to human resource management (HRM)	156 articles in final dataset	Relevance of organisational resilience literature for HRM	Content analysis through automatic identification of concepts by Leximancer, comparative analysis of concepts, focussed analysis (review)	Concepts: organisation, capabilities, dynamic capabilities, processes, resource, change, firm, management, environmental and knowledge	Literature review in three stages; documented impact of individual resilience on organisational resilience; definition of utility of organisational resilience for HRM
Sahebjamnia et al. (2015)	Organisation	“it enquires organizations to develop effective plans for both short-term resuming (i.e., BC plans) and long-term restoration (i.e., DR plans) of their disrupted operations following disruptive events” (p. 261, following Riolli & Savicki (2003))	Conceptual, modeling	Integration of business continuity (BC) planning and disaster recovery (DR) lens to form basis for resilience	Resilience as the outcome from both BC and DR (process steps, different continuity and disaster recovery plans)	Loss of resilience as reduced operating level and required time to recovery (p. 263)	Integrative framework (IBCDR – Integrated Business Continuity and Disaster Recovery Planning) conceptualised and modeled
Sawalha (2015)	Organisation, insurance sector	“resilience is considered to be the positive side of vulnerability” (p. 348);	28 Jordan insurance companies, surveys and interviews	Understanding of resilience concept in Jordan insurance sector; the impact of various factors on resilience	5 factor model of resilience (outcome)	Vulnerability to resilience model (V2R) (p. 351) used to measure resilience	Study shows the significant impact of culture on resilience (p. 361); various key factors of resilience were absent in the responses which signals potentially lower resiliency levels

Table 10 – literature review summary XIX (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Mendonça & Wallace (2015)	System and Organisation	Summary of various definitions; no formal definition	1 case study on firm responsible to restore power post 9/11	resilience from a broader lens (both system and organisation); Woods' 4 factor resilience model as basis (Hollnagel et al., 2006) from a systems engineering view	Factors determining and processes creating resilience (outcome)	Buffering capacity, flexibility/stiffness, margin, tolerance, and boundary-spanning capability	Additional factor was defined: boundary-spanning capability
Valero et al. (2015)	Organisation, Individual (leadership), public sector	“organization’s ability to respond and recover from a disaster” (p. 4); “resiliency should also capture whether response strategies to the disruption were in fact effective adaptive strategies” (p. 5)	112 survey responses from emergency departments and non-profit organisations in South Korea	Effect of transformational leadership on perceived resilience in public sector; Integration of (transformational) leadership perspective and organisational resilience;	Transformational leadership builds resiliency through identification of a shared vision of how to handle future disruptions and ensure cohesiveness in execution (p. 6) (outcome and capacity to build)	Resiliency via robustness, rapidity, resourcefulness and redundancy (p. 10) and leadership through influence, motivation, stimulation p. 11)	Transformational leadership is shown to have a positive ($p \leq 0.01$) relation with perceived organisational resiliency (p. 14); elected officials (e.g. mayors) put more focus and emphasis on building resiliency compared with appointed officials
Mafabi et al. (2015)	Organisation	“responds to the demands in the environment for survival (organisational adaptation), is efficient and effective at service delivery (organisational competitiveness) and makes itself reputable (organisational value)” (p. 570)	51 parastatal organisations in Uganda, 242 survey responses	Investigation of the mediating role of innovation on the relation between creative climate and organisational resilience	Resilience as criterion variable, creative climate the mediator (main effect) (outcome, criterion)	(Perceived) resilience through organisational adaptation, competitiveness, value (Cronbach’s $\alpha = 0.893$, p. 570)	Development of composite measure for organisational resilience; Strong positive correlation between innovation and resilience ($p < 0.01$) and limited mediation effect of innovation (p. 580) due to strong direct effect of creative climate on resilience

Table 10 – literature review summary XX (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Cavaco & Machado (2015)	Organisation	Indirect: “competitiveness can be defined as the readiness to react to disturbances that affect company’s performance and the willingness to leverage performance in a proactive way” (p. 158)	Conceptual	Reconceptualisation of strategic planning such through integration of resilience and innovation to form a new model of competitiveness	Resilience as one of the input factors (input variable)	Competitiveness = 1 – (Resilience + Innovation) where Resilience = $\frac{1}{2}$ (Severity x Recovery Time)	Reconceptualised model of competitiveness where resilience and innovation are key measurement components (p. 163)
Manfield & Newey (2015)	Organisation (action perspective)	“remaining capable even when things seem incapable” (p. 373);	Longitudinal case study with Active-Sky over 14 years	How do organisations remain capable when capabilities are gone? (p. 373); business performance swings and inflection points as indicators of up- and downswings	Resilience operationalised as capabilities enabling organisations to thrive in difficult times (capabilities, indirect)	Multi-cycle capability as the capability to rebuild from repeated shocks as resilience	Developed model of multi-cyclcy capability that builds resilience in the firm (p. 385); deliberate building of resilience in times of resource abundance and strategic coherence (p. 386)
Management Today (2015)	Organisation, individual	“the ability for businesses to anticipate, prepare for and adapt to change“, “In 2015 it’s about change, disruption and being prepared” (p. 58)	Forum-discussion	How do organisations and individuals anticipate, prepare and adapt?	Resilience as the capacity to anticipate, prepare and adapt in times of turbulence (capacity)	Alignment of people and processes with strategy, values and culture of the organisation	Various conceptualisations of what is resilience on organisational and individual level; what capabilities and processes ought to be developed and employed?

Table 10 – literature review summary XXI (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
van der Vegt et al. (2015)	Society, Organisation	“Resilience reflects the ability of systems to absorb and recover from shocks, while transforming their structures and means for functioning in the face of long-term stresses, change, and uncertainty” (p. 972)	Conceptual, literature review	Integration of organisaitonal and societal view relative to resilience – organisations enable societal resilience; How do some societies and organisations survive or even perform better during and after crises than others? (p. 917); Larger scale and impact of adversity is due to increased density of global people, organisational and country networks (p. 971)	Resilience through “capabilities and capacities that create or retain resources in a form sufficiently, flexible, storable, convertible, and maleable that enables systems to successfully cope with and learn from the unexpected” (p. 972, following Sutcliffe & Vogus (2003)) (capabilities, capacities)	Characteristic of a system; through the identification of capabilities and capacities of subsystems and parts of such and the understanding of the interaction among each other as well as with the environment (p. 973)	Integration of various research streams to yield a state-of-the-art view of the current resilience literature in management scholarship; various avenues for further study have been proposed
Castellacci (2015)	Organisation	“the ability of an organization to adapt to changes in its economic and institutional environment” (p. 46)	World bank enterprise survey database with about 13.000 firms in 20 Latin American countries from 2010 to 2011	Organisational resilience thesis based on agency theory and corporate governance as well as evolutionary econom-ics	How country-specific factors affect the innovativeness of group-affiliated (GAFs) and stand-alone (SAFs) firms by employing two contrasting theses: institutional voids and organisational resilience (p. 43) (thesis)	Indirectly measured: Finance, stock, legal, trust, labor, tertiary enrollment ratio (pp. 49, 53-54)	Innovation performance of GAFs stronger for more resilient economies (hypotesis 1b is supported, which contrast ealier views in the literature on innovation and business groups)

Table 10 – literature review summary XXII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Ortiz-de-Mandojana & Bansal (2016)	Organisation	“the incremental capacity of an organization to anticipate and adjust to the environment. Organizational resilience is not a static attribute that organizations either do or do not possess” (p. 1617); “Organizational resilience provides firms with adaptive capacity that facilitates continuous improvements and improves the firm’s viability” (p. 1627)	121 matched-pairs across industries in the US between 1994 and 2008	Social and environmental practises (SEPs) aid firms sense and seize long-term opportunities and mitigate threats (p. 1615); “To become resilient, firms need to invest in processes that sense and correct maladaptive tendencies, and build resources that allow firms to cope with unexpected circumstances” (p. 1628)	Resilience as outcome from a combination of SEPs and business sustainability (outcome, capacity, capabilities)	Indirectly measured through financial volatility, higher long-term growth and higher survival rate over time period (p. 1628)	SEPs indirectly lead to more resilient firm performance over longer periods of time – resilience here is indirectly measured through e.g. low financial volatility over 15 year period
Annarelli & Nonino (2016)	Organisation	“[...] is static, when founded on preparedness and preventive measures to minimize threats probability and to reduce any impact [...], and dynamic, when founded on the ability of managing disruptions and unexpected events to shorten unfavorable aftermaths and maximize the organization’s speed of recovery to the original or to a new more desirable state” (p. 3)	Conceptual, literature review (bibliographic analysis through co-citation analysis)	Resilience as both static and dynamic capability	Resilience as capability (capabilities)	Dynamic, supply networks, static, single organisation (Fig. 2, p. 9, 10)	Integration of definition, categorisation of prior research into four broader themes (measurement) (p. 10); research is not infant however also not fully developed; future research agenda proposed (p. 11) (e.g. focus on design, implementation, improvement of processes; measurement of resilience; SMEs; anticipatory innovation; strategic approach and dynamic capabilities)

Table 10 – literature review summary XXIII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
De Carvalho et al. (2016)	Organisation	“Organizational resilience is defined as the ability and capacity of an organization to withstand unexpected changes, discontinuities and environmental risks” (p. 2)	10 of the top 50 most innovative companies in Brazil (2008-2009, 2011-2014)	Innovation as a contributing factor to resilience	Resilience as outcome of innovativeness of firms (outcome)	Resilience as indirectly measured through innovation performance (p. 8)	Higher performance for more innovative companies within same economic sector (p. 13)
Kolay (2016)	Organisation	“organizational resilience has been measured here by the extent of successful change over time to reflect the strength of any organization to withstand ‘sudden blows’” (p. 300)	Case study with 2 companies in food processing in SE Asia 2001-2012	Following the definition of resilience in engineering	Resilience as the outcome of various factors (outcome)	Extent of successful overall change, continuity of change over time and firm size (p. 304)	Development of measurement concept of organisation resilience; one of the cases was found to outperform the other by being 5.2 times more resilient
Kerr (2016)	Organisation	“the ability of an organization to anticipate, prepare for, respond and adapt to incremental change and sudden disruptions in order to survive and prosper” (p. 40)	Conceptual	Resilience as a value driver for long-term robust performance of the organisation	Resilience as input variable (input, antecedent)	Product, people & processes (elements); adaptability, agility and robust governance (qualities)	Practitioner-oriented model / framework for enhanced resilience in the organisation

Table 10 – literature review summary XXIV (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Chen (2016)	Teams	“the ability of an organization to anticipate, prepare for, respond to, and adapt to incremental change and sudden disruptions in order to survive and prosper” (p. 1)	509 Chinese R&D teams and 1 in-depth case study (JMC)	Organisational resilience of R&D teams; applied early risk warning theory	Resilience operationalised through various factors (outcome)	Five-factor model: shared vision, willingness to learn, adaptability, co-operative awareness, work enthusiasm	Five factor model of organisational resilience in R&D teams; early risk warning model is developed and then tested based on the case study
Andrew et al. (2016)	Organisation	“ability of a community to rebound from an adverse situation [...] a process of adaptation manifested in the psychological wellness, functioning, and quality of life of the community” (p. 65, Norris et al. (2008))	Semi-structured interviews with 44 Thai companies in 2011	Institutional collective action framework – two theorised hypotheses: bonding (organisations collaborate closely) and bridging (organisation positions itself as a central actor to acquire resources)	Resilience as an outcome (outcome)	Robustness, redundancy, resourcefulness and rapidity (following Bruneau et al. (2003))	Bridging effect was observed to be more closely related with resiliency; Organisations in rural provinces were more resilient and public sector organisations were generally more resilient
Breda (2016)	Organisation (human service organisation)	“competencies and processes that people utilize to overcome adversity” (p. 63)	Conceptual	Resilience theory – higher levels of resiliency in human service organisations ensure more robust performance	Resilience as the capacity of building human service organisations	Resilient workplace, staff complement, resilience-oriented model	Conceptual three component model for building a resilient human service organisation
Buliga et al. (2016)	Organisation	“organizational resilience is the capacity to act robustly in the face of environmental turbulence and to adapt to the ongoing environmental changes” (p. 652, following Lengnick-Hall et al. (2011))	Conceptual	Integration of business model innovation (BMI), resilience literature and regulatory focus theory (individual), as well as the integration of organisational ambidexterity (exploitation and exploration)	BMI as an integral part of the organisational response to foster resilience (outcome)	Resilience through robustness and adaptability	Conceptual integrative framework of BMI and organisational resilience, in which BMI sits on the adaptability side of the continuum (p. 654); conceptualisation of resilience-continuum (p. 654)

Table 10 – literature review summary XXV (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Clément & Rivera (2017)	Ecosystem, organisation	“firms’ ability to maintain or regain functioning despite a major mishap or in the presence of continuous stress” (p. 1, following e.g. Sutcliffe & Vogu (2003))	Conceptual	Resilience theory from socio-ecological perspective; firms and ecosystems as parts of broader socioecological systems; adaptation and transformation as key concepts	Resilience as adaptation through cyclical process (outcome, property or characteristic)	Dynamic firm property that integrates processes of adaptation and transformation alike	extension of resilience literature to ecological adversity and thereby extending the discussion on organisational resilience to ecological adversity
Teo et al. (2017)	Organisation, individual (leadership)	Summary of both trait-based (ability of the system to return to a stable state) and developmental view (resilience develops in response to crsies) (p. 137)	1 case study of Tan Tock Seng hospital Singapore SARS outbreak in 2003	Relational activation of resilience model: how do leaders activate and utilise relationships to “activate resilience during crisis” (p. 136)	Resilience as a system-property that is being activated and developed (property, outcome)	Formation of new social networks, relational connections, collective meaning- and sensemaking, and communicate mindfully	Relational Activation of Resilience model (RAR)
Conz et al. (2017)	Organisation, SMEs, mature clusters	“resilience is the capacity to act or react in response to these unpredictable events to prevent them from having a negative impact on profitability and even, in some cases, turning them to the firm’s advantage” (p. 187)	Exploratory case study with o 1 matched pair of wineries in Italy	Resilience at the interplay between SMEs and firm clusters – revision of the adaptive cycle model to explain how SMEs embedded in local system (clusters) can foster resilience; evolutionary perspective of resilience	Resilience being influenced by the relationship cluster-SME – connectedness and resilience (outcome)	Conceptual	Framework for resilience strategies in SMEs: four resilience strategies (adapted from Reinmoeller & Baardwijk (2005)) integrated with the model of economical resilience of regions (Simmie & Martin, 2010)

Table 10 – literature review summary XXVI (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Gimenez et al. (2017)	Organisation	“Organizational resilience goes beyond traditional risk management methods and it accepts that organizations must prepare for expected risk as well as for the unexpected” (p. 161, following e.g. Labaka et al. (2016))	Delphi study of 30 experts in the field of disaster management across 13 countries	Involvement in virtual communities of practise (VcoPs) potentially increases the resilience of disaster management organisations	Resilience being enhanced through involvement in VcoPs by building on resilience principles (outcome)	Top management commitment, staff engagement, training and preparedness, situation awareness, flexibility and networking	Six main principles of resilience; Resilience level of the organisation can be enhanced through participation in VcoPs; VcoPs are perceived to improve resilience across all six principles
Dalgaard-Nielsen (2017)	Society, organisation	“anticipate, prevent or effectively contain familiar risks, while rapidly adjusting and adapting when facing an emerging unfamiliar threat or hazard” (p. 343, following e.g. Dahlberg et al. (2015))	interviews with 12 Danish national security bureau CEOs	Resilience as the guiding principle to manage complex and dynamic threats	Resilience competes with fiscal austerity, resilience and accountability (outcome)	Prioritisation of fiscal austerity, accountability over delegation and experimentation	The structure and way of public policymaking hinders resilience-building in such organisations
Villemain & Godon (2017)	Minimal organisation	“A system is resilient if workers adapt themselves by understanding the context in which adaptation takes place” (p. 210)	Case study of the polar traverse between 2012 and 2015	Organisational resilience through a safety management lens	Resilience strategies through alternating reactive and proactive action (tactics, outcome)	Dynamic convoy organisation (proactive) and competences and risk evaluation (reactive)	Mechanical, organizational and interventions allowed for unexpected crises; pro-active alternating with reactive actions; survival of vital parts of the system needs to be ensured at all cost (p. 217)

Table 10 – literature review summary XXVII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Ruiz-Martin et al. (2017)	Organisation	Various definitions summarised, no formal definition outlined	Conceptual	The application of the viable system model (VSM) view to organisational resilience	VSM inflicting the ability to survive despite changes external to it (outcome)	Evolution, growth, absorb variability, learning, adapting	Outline of micro-, meso- and macro-economical view of resilience (p. 96); Integration of VSM and resilience theory
Tejeiro Koller et al. (2017)	Organisation	“incremental capacity of an organization to anticipate and adjust to the environment” ((Ortiz-de-Mandojana & Bansal, 2016)	52 surveys across sectors in Spain (survived for 50 years)	Corporate culture (innovation culture) key to competitiveness (resilient); key concept of adaptive advantage (dynamic capabilities)	Resilience as an outcome of innovative culture (adaptive advantage) (outcome, indirect)	Innovative culture leads to adaptive advantage leads to resilience	Innovative culture does help companies survive (i.e. be more resilient) however does not necessarily lead to higher returns (p. 350)
Mzid (2017)	Organisation, family firms	Following the definion of Lengnick-Hall & Beck (2009)	5 case studies surveyed in 2013 with firms in Tunesia	Impact of family capital (human, social, fin-ancial and survivability) on resilience; sustainable family business theory	Resilience as the resulting capacity through leveraging capital (outcome)	Absorptive capacity, strategic renewal, appropriation (p. 51)	Social capital seems most critical for resilience where the social interactions influence resource allocation (p. 59)
Blades (2017)	Economy, organisation	Various definitions summarised relative to the way a firm manages it (p. 669)	Conceptual	By the way a firm manages resilience, a different economical perspective applies	Uni-, multi- and beyond equilibrium (characteristic)	According to definitional frame	Integrative view of resilience across multiple perspectives of equilibria and levels
Asch & Mulligan (2017)	Organisation	“[...] overcoming stress and adversity, thriving in times of chaos” (p. 54)	Opinion piece (on the San Diego Zoo)	Leadership as one of the key drivers of resilience (p. 54)	Resilience as an outcome of various factors (outcome)	Workforce, brand equity	Resilience at Work model (previously developed by the author)
Linnen-luecke (2017)	Organisation, individual	Various definitions summarised	Conceptual, literature review	Summary of various theoretical lenses and perspectives	Various	Conceptual	E.g. employee resilience, business model adaptation; new directions (Table 9, p. 26)
Williams et al. (2017)	Organisation	“organizations, systems, or individuals that are able to react to and recover from duress or disturbances with minimal effects on stability and functioning” (p. 740)	Conceptual, literature review	Integration of crisis management and resilience literatures to arrive at an integrative framework (p. 751)	Various	Conceptual	“resilience evolves over time as the actor (i.e., individual, organization, or community) interacts with the environment (i.e., adversity), highlighting the dynamism of resilience” (p. 750)

Table 10 – literature review summary XXVIII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Sahebjamnia et al. (2018)	Organisation	“an organization could be considered resilient if it is able to continue its critical functions at least in the Minimum Business Continuity Objective (MBCO) level within the Maximum Tolerable Period of Disruption (MTPD) after any disruption” (p. 65, following International Organization for Standardization (2012))	Conceptual, modeling, case study	Integration of business continuity and disaster recovery palnning (BDCRP)	Resilience as the outcome of integrating business continuity and disaster recovery planning (outcome)	Impact of disruptive incidents on resources: human, equipment, facilities, raw materials	The proposed BDCRP model seems to “play a positive role in the improvement of organizational resilience” (p. 80) through e.g. enabling the selection of the most effective business continuity and disaster recovery plans or enabling the preparation of resources according to avoid shortage of such in case of disaster (p. 80)
Korber & McNaughton (2018)	Organisation, entrepreneur	Various definitions summarised	Conceptual, literature review of 144 papers	Intersection of resilience and entrepreneurship literatures	Various	Conceptual	6 streams, each of which draws from distinct notions of entrepreneurship and resilience
Kahn et al. (2018)	Organisation, intercompany groups	“an organization’s ability to absorb strain and preserve or improve functioning, despite the presence of adversity” (p. 509, following Sutcliffe & Vogus (2003))	Conceptual	“sustained adversity can trigger strain that gets localized as specific parts of organizations experience excessive demands” (p. 510); dynamics and pathways arising through localised strain in specific parts of the organisation	Resilience as the outcome of intergroup relations’ dynamics in responding to creeping strain (outcome)	Pathway dimensions: integration, disavowal, reclamation	Establishing contrarian view to resilience of the organisation as a whole; resilience can be viewed as dynamics and pathways between various parts of the organisation (p. 524)
Prayag (2018)	Tourism Sector, Organisation	Various definitions summarised	Conceptual	The shift from crisis management and disaster planning to resilience in tourism studies	Crisis management (extraordinary only) vs. resilience (both)	Conceptual	A case for a shift to resilience rather than crisis management in tourism studies

Table 10 – literature review summary XXIX (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Tisch & Galbreath (2018)	Organisation, agriculture	Following Linnenluecke et al. (2012)	36 dairy farmers in New Zealand	Sensemaking as constraint and enabler for resilience in response to weather extremes	Resilience is enabled (constrained) through sense-making (outcome)	Community sensegiving in familiar settings	Adaption to climate change seems to be anticipatory; social relationships are key
Duchek (2018)	Individual entrepreneur	Ability to anticipate, overcome and change to emerge stronger than before	Conceptual literature review	Entrepreneurial resilience	Result behaviour and contextual factors (outcome)	Individual, situational and process-related	Study of resilience in entrepreneurship is scarce; situational, process facets are key
Burnard et al. (2018)	Organisation	Adjustment to disruption, thus the ability of managing changing environment	Case study with 3 UK organisations	How do processes of response support building (ex and post) organisational resilience?	Resilience as the outcome of adaptation and preparation (outcome, process)	Measured as reactive/rigid, proactive/agile (4 config.)	Definition of iterative resilience process consisting of four response and three decision-making nodes
Carlson (2018)	Organisation	“[...] how a system reacts to a disruption” (p. 213)	1 case study on Canadian energy firm	How can renewal discourse (post-crisis communication) build resilience?	Resilience being fostered through preparedness (comm.)	Renewal discourse, associated conditions	Illustration of different kind of renewal, not focussed on rebound to prior state, but on building vigilance (p. 222)
Manfield & Newey (2018)	Individual, entrepreneur	“positive adaptation to adversity” (p. 1155, following Hayward et al. (2010))	Conceptual	Different kinds of threats require different resilience responses (capabilities)	Resilience as enactment of a portfolio of capabilities (outcome, capabilities)	Routine and heuristics capability	Entrepreneurial organisational resilience results from a portfolio of capabilities that is enacted contingent upon kind of threat
Martinelli et al. (2018)	Individual, entrepreneur	“a key feature in the responses individuals, systems, or organizations exhibit to adverse and unexpected events” (p. 1224)	Natural experiment of 8 retail entrepreneurs in Italy in 2012	Formative dimensions – dynamic capabilities (DC) and social capital (SC) as basis	Resilience through dynamic capabilities and social capital (outcome, capabilities)	Varying enactment of DC and SC time-varying	Contribution different DCs and SC varies according to temporal phase
Andersson (2018)	Organisation, individual	No formal definition outlined	1 longitudinal case study in automotive subcontractor	Social structures and follower-ship as resilience factor	Resilience built through enactment of social structures (outcome)	Engagement of workers, distributed leadership, culture	Social structures are important for building organisational resilience, particularly in certain sectors

Table 10 – literature review summary XXX (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Branicki et al. (2018)	Organisation, SMEs, individual, entrepreneur	Entrepreneurial resilience as a combination of individual resilience and the entrepreneur (p. 1251)	11 UK focus groups, 19 SME participants	Integration of entrepreneurial with SME resilience as basis for SME resilience (contrary to traditional view) (p. 1251)	Resilience as outcome of entrepreneurial capabilities (outcome, capabilities)	Connections, Autonomy, Innovation, uncertainty (p. 1257)	Delimitation of individual and entrepreneurial resilience (p. 1248); entrepreneurial resilience leads to SME resilience mechanisms lead to resilient SME, organisational resilience constraining resilient SME
Edström (2018)	Business clusters, organisation	No formal definition outlined	1 cluster with 12 companies in Sweden	Resilience of business clusters over time, despite individual members face difficulties relative to fundamental changes	Resilience as the outcome from collaborative efforts (outcome)	Competition, development, spread of ideas, spin-offs	A collaborative network between industry, academia and authorities;
Bouaziz & Smaoui Hachicha (2018)	Organisation	“Resilience turns an unfavorable condition into an advantage as it deals with the situation” (p. 539, following Kantur & Say (2015)	Sample of 97 firms in Tunisia from 2011 to 2016	Strategic Human resource management (SHRM) practises as enabler for organisational resilience	SHRM practises impacting certain dimensions of organisational resilience (outcome)	Robustness, agility and integrity (p. 542)	SHRM practises do impact organisational resilience; depending on time period, robustness is enhanced while agility, integrity influenced
Ishak & Williams (2018)	Organisation, HROs	“the process of reintegrating from disruptions in life” (Richardson, 2002, p. 309)	Conceptual, case study with US forest service	For certain organisations resilience is the defining character, as such it is more important for HROs	Resilience is approached differently e.g. non-HROs (outcome, process)	Identity management, re-integration, communication	Dual spectral model of resilience (p. 187): amount (rigid – resilient) vs. type (adaptive – anchored)
Morais-Storz et al. (2018)	Organisation	Strategic resilience: “resilience needed in the ongoing here-and-now of pervasive turbulence, complexity and uncertainty (rather than only in crisis) that is faced by established firms (who notoriously struggle with renewal)” (p. 1182)	Conceptual	Aiming to create synergy between strategic management and entrepreneurship	Strategic resilience as the response to ongoing struggle, rather than organisational resilience seen as response to crises (concept)	Problem formation, TMT future orientation (innovation) and metamorphosis	Reconceptualisation of organisational resilience as strategic resilience which is the response to ongoing struggle through organisational renewal and survival

Table 10 – literature review summary XXXI (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Tengblad & Oudhuis (2018)	Organisation	“not only a capability but also a philosophy of how organizations can manage surprises [...]” (p. 233)	Conceptual	Organisational resilience not only as capability but also as philosophy on how to manage adversity	Resilience as capability and outcome (outcome)	As trait, process, resource, capability, prime sources	Organisational resilience framework (p. 236)
Carden et al. (2018)	Organisation	“individuals, or a system, can withstand stress or bounce back, or recover its prior shape after a distribution” (p. 26)	Case study with McDonald’s	Corporate Social Responsibility (CSR) as the main underlying premise of business operations for building a resilient organisation	Resilience as the result from applying the organisational resilience model framework (outcome)	Inputs (CSR), processes (project management) and outputs	Organisational resilience model (p. 27)
Gover & Duxbury (2018)	Organisation	“an organizations’ capacity to withstand changes over time” (p. 477)	39 interview respondents in health care	Enablers and inhibitors of organisational resilience through employees perception	Resilience is impacted (enabled, inhibited) by various factors (outcome)	People, context, processes, environment	Insider conceptualisation of organisational resilience (p. 494)
Sincorá et al. (2018)	Organisation	“survival and growth of these organizations are linked to their ability to effectively use these large volumes of data from different sources” (p. 385)	82 survey responses from firms in Brazil	Business Process Management Maturity (BPMM) as antecedent of organisational resilience (OR) moderated by organisational analytical capabilities (OAC)	Resilience as the result of business process maturity (outcome)	OR measured as anticipation, adaptability and recovery	OAC and BPMM each positively impact OR, where OAC also positively impacts the relation between BPMM and OR
Van Trijp et al. (2018)	Organisation, Safety Regions	“[...] outcome of situational awareness, re-silience as a generic, key-stone vulnerabilities, adaptive capacity and quality” (p. 310, following van Trijp et al. (2012))	Conceptual, literature review and case study	Adaptive learning capabilities and strong network relationships foster strong organisational resilience levels	Resilience as the result from a combination of capabilities and network relations (outcome)	Situational awareness, key-stone vulnerabilities and adaptive capacity and quality	Six types of resilience, quantitative organisational resilience model for Dutch emergency response organisations
Tengblad (2018c)	Individual, leadership	No formal definition outlined	Conceptual, case study	Leadership qualities as enablers for firm resilience	Resilience indirectly impacted (outcome)	Followership, courage, adaptation	Deduction of resiliency impact factors from leadership qualities

Table 10 – literature review summary XXXII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Verreynne et al. (2018)	Organisation, entrepreneurial firms	“capacity to respond, adapt and transform in response to sudden adverse events” (p. 1122)	Conceptual	Resilience capabilities in response to adverse events	Resilience as capabilities (capabilities)	Conceptual	Resilience and other concepts; overcome context-specificity; methodological challenges; longitudinal study
Tengblad (2018a)	Organisation	“ability to act swift, agile and imaginatively for preventing crises and to exploit opportunities” (p. 39)	Conceptual	A resource-based view of organisational resilience	Financial, technical and social resources as the foundation of the model (concept)	Conceptual	Conceptualisation of a three-dimensional resource-based model of organisational resilience (p. 40)
Jansson (2018)	Organisation	“Financial resilience includes the balance between assets and debts and also resources like profitability, liquidity and ownership structure” (p. 111)	Conceptual, 6 case studies	Financial resilience view	Financial resilience being fostered through ownership, financial resource of solidity, liquidity and profitability (outcome, concept)	Conceptual	Ownership seems to be one of the most important factors, followed by solidity, liquidity and profitability
Tengblad & Oudhuis (2018b)	Organisation	“capacity to use its technical, economic and social resources in order to develop long-term skills and competencies, in an efficient, reliable and flexible manner, and in a way it could manage challenges and exploit opportunities” (p. 3)	Conceptual	Organisational resilience defined as maintenance of the vitality of the firm in an ever-changing environment	Resilience as the capacity to use technical, social and economical resources that in turn enable the development of long-term capabilities (capacity)	Conceptual	Organisational resilience framework outlined that encompasses capabilities that both enable the management of challenges and exploitation of opportunities
Tengblad (2018b)	Organisation	“organizational resilience is seen as the capacity of a company to over time become a selected variation in the marketplace” (p. 19)	Conceptual	Based in an organic view of economic and organisational development, using concepts of variation, selection and retention; complexity theory	Resilience as anticipate, monitor, respond and learn (outcome, framework)	Conceptual	A capability-oriented model of organisational resilience (p. 37)

Table 10 – literature review summary XXXIII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Eriksson (2018)	Organisation	No formal definition outlined	Comparative case study	The highly reliable organisation in health care	Resilience by followership (outcome)	Conceptual	Follower's ability to improve, cooperate and learn are key
Oudhuis (2018)	Organisation	Stagnation and resilience	Case study in fashion sector	Long periods of stagnation are turned around triggered by new ownership	Resilience through economic, technical, social resources mediated by trust (outcome)	Conceptual	Debt-restructuring, profitability, remix of product lines as well as an innovative organisational structure needed
Ma et al. (2018)	Organisation	"an organizational capability to survive in, adapt to, bounce back from and often thrive in unexpected, sometimes disastrous events and, in more broad sense, turbulent environments" (p. 253)	Conceptual, literature review	Dynamic (capability) view or organisational resilience; Resilience as: capability to cope with crises, emphasis on survivability, adaptability and a multi-level concept that is related to organisational resources, routines and processes (p. 255)	A multi-level, dynamic capability (p. 255); multi-dimensional capability and closely linked to coping strategies (p. 256) (capabilities)	Adaptability, agility, flexibility, improvisation, recovery, redundancy and robustness (Table II, p. 254)	A dynamic (capability) view of organisational resilience that integrates a variety of factors (Table II, p. 254), which should further be viewed at from three different levels (individual, group and organisation)
Butler (2018)	Organisation	"the ability to learn and adapt in real time, to emerge from the crisis stronger, better and fitter than before" (p. 105)	Conceptual	Resilience from a dynamic, innovative and proactive view (p. 103); integrative view of resilience and risk management	Resilience is built through a five-step approach; internal, external, vertical and horizontal collaboration (outcome, steps)	Execution of five-step approach	Dynamic view of resilience; integration of risk management view (p. 106); five step approach to building resilience
Hillmann et al. (2018)	Individual	"cope with turbulence that encompasses uncertainty and unexpected events" (p. 464)	Exploratory experimental character study with 22 students	The individual manager as a microfoundation of organisational resilience; managerial education, learning; managerial cognition	Resilience capacity is built through skilled individuals (cognition) (outcome, capacity)	Combination of strategy framework and experiential learning (indirect)	A positive outcome of the learning intervention could be observed; positive impact on anticipation and sense-making was analysed (p. 485)

Table 10 – literature review summary XXXIV (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Barasa et al. (2018)	Organisation	“a system’s ability to continue to perform and meet its objectives in the face of challenges” (p. 496)	Conceptual, health care sector focus, literature review	Summary of various theoretical lenses	Resources, preparedness, information flow, redundancy, governance, leadership, culture, human capital, social networks and collaboration (p. 497-500) (outcome)	Conceptual	Resilience is not just the system’s ability to withstand shocks but also to adapt and transform (p. 491)
Pradhan & Bhattacharyya (2018)	Organisation, individual	Various definitions summarised	Conceptual	Integration of personal and organisational level to form organisational resilience	Cherishing at work leads to personal resilience and directly to organisational resilience (outcome, antecedent)	Conceptual	Integration of personal and organisational resilience; cherishing at work impacts both personal and organisational resilience directly
Collier (2018)	Organisation, MNEs	“complex system responses to challenges that allow organizations to resist and recover from disruptions” (p. 2)	Thesis, 109 MNEs in 123 countries	Organisational resilience in conjunction with organisational learning and internationalisation literatures	High internationalisation efforts of MNE contribute to resilience; how does MNE resilience relate to performance? (outcome and mediator)	Internationalisation impacts magnitude of resilience which then impacts performance maintenance and recovery	“high magnitude of resilience MNEs tend to outperform low magnitude of resilience MNEs following a crisis event and that stakeholder [desirability] moderate the relationship between magnitude of resilience and MNE performance” (p. ii)
Leszczynska (2018)	Organisation, weather extremes	“capacity to survive the period of disruption and quickly restore organisational structures” (p. 663)	Conceptual, literature review	Resilience as response to extreme weather conditions	Resilience as a response based on four categories	Communication, coordination, authority and learning	Four categories of organisational resilience in response to adverse weather changes were identified through literature review

Table 10 – literature review summary XXXV (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Koronis & Ponis (2018)	Organisation	“Organizational resilience can be looked as not only the ability to absorb or adapt to disturbance, disruption and change but also the developed capacity to recognize and adapt to unexpected changes” (p. 34)	Conceptual, framework	Organisational resilience as a new strategic lens on crises management – organisational resilience as the preferential	Resilience combined as (1) strategic, (2) functional and (3) people (p. 34) to a strategic view (outcome, capabilities, strategic perspective)	Drivers: Preparedness, responsiveness, adaptability, learning; cultural traits: trust, perceived identity, firm culture (p. 39)	Summary of three approaches to resilience; proposed framework for organisational resilience: drivers based on cultural traits yield a resilient organisation (p. 39)
DesJardine et al. (2019)	Organisation	“both the ability of a system to persist despite disruptions and the ability to regenerate and maintain existing organization (Gunderson & Pritchard, 2002, p. 6)	963 US-based firms across various sectors in their responses to the 2008 financial crisis	Social and environmental business practises (SEP) as contributing factors to organisational resilience	Resilience as a latent variable that is measured through organisational outcome (outcome, latent)	Severity of organisational losses (stability), time to recovery (flexibility) (p. 1437)	Strategic SEPs contribute more to organisational resilience than do tactical SEPs (p. 1450ff)
Branicki et al. (2019)	Individual	“. . . [cap]ability to adapt, endure, [recover] . . .” (Markman & Venzin, 2014, p. 1106)	47 semi-structured interviews, 11 focus groups and 137 managers	Individual resilience in response to day-to-day stressors and how human resource management interventions can support organisational resilience building	Resilience as the outcome of individual micro-processes (outcome, individual micro-processes)	HRM interventions lead to enhanced individual resilience which leads to firm resilience	Identified micro-processes have significant implications for individual and organisational resilience; two-dimensional framework for literature review (p. 1264);
Wood et al. (2019)	(large) Organisation	No formal definition outlined	Case study on US state dept. Of the Army	Quantification of resilience in large organisations	Across threat event cycles, domains mapped to metrics (measure)	Across domains and cycle phase	Matrix: Plan, absorb, adapt phases; physical, information, cognitive and social domain
Mzid et al. (2019)	Organisation, family firm	“. . . pool of individual and family resources that protect a family firm from a disruption . . .” (p. 253)	4 case studies with Tunisian firms 2011-2014	Sustainable family business theory; “How does being a family business contribute to resilience? (p. 249)	Resilience strengthened through social capital of the family business (outcome)	Human, social and financial capital of the family firm	Social capital contributes the most to resilience of the family firm; financial capital determined by social capital

Table 10 – literature review summary XXXVI (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Darkow (2019)	Organisation	“... to cope successfully with crises, organizations need to enact varying practices during different phases...” (p. 146)	Conceptual	Two basic approaches in resilience research: plan to resist and containing crisis approach	Resilience as latent characteristic that can be observed post crisis survival (outcome, latent)	Conceptual	Integral, capability-based concept of organisational resilience is presented where threat is seen as inherent rather than one-off (p. 150)
Herbane (2019)	Organisation, SMEs	“... an adaptive process and capacity of an organisation to address major acute and strategic challenges through responsiveness and reinvention to achieve organizational renewal” (p. 478)	265 SMEs in UK	Integrative view of strategic renewal and organisational resilience	Differences in formalisation of activities for growth and resilience impact resilience (outcome and input)	Planning, testing, awareness, training, role assignments, networks, certification for continuity / risk management	Four clusters are identified: attentive interventionists, light planners, rooted strategists, reliant neighbours (p. 485ff); growth-survival-maturity perspective on SME reliance is developed (p. 490)
Barton & Kahn (2019)	Team, group	“... absorb strain and maintain functioning in the face of adversity” (p. 1409)	Conceptual, framework	Group relations theory; relational perspective on how adversity triggers anxiety in teams and how this affects organisational resilience	Adversity-triggered anxiety forces individuals on either one of two paths which then impacts overall resilience (outcome)	Conceptual	Two intragroup behaviour trajectories are conceptualised: brittle (defensive patterns, vulnerability) and resilience (defuse and mitigate adversity)
Witmer (2019)	Organisation	“... agile capacity to rebound, learn, and transform when impacted by severe disruption” (p. 511)	Conceptual	Degendered model of organisational resilience based on the model, practises and other research on gendered organisations	Power structure, actions and language of gendered organisational practises (framework)	Conceptual	Conceptual framework summarising three different aspects of gendered organisational practises is presented (DOR model, p. 518)

Table 10 – literature review summary XXXVII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Andersson et al. (2019)	Organisation, structures	“... activities that aim to prevent the unexpected from happening or directing activities to stop undesirable events.” (p. 37)	Case study	Different organisational structures have differing impact on the building of traits for organisational resilience; long-term, anticipatory view of resilience	The capacity to build traits such as risk awareness, cooperation, agility, improvisation (capacity)	How do certain organisational structures enable or hinder building of traits	Power distribution and normative control can create preparedness and action orientation as well as aid organisational alignment
Hsu et al. (2019)	Organisation	“the incremental capacity of an organization to anticipate and adjust to the environment” (Ortiz-de-Mandojana & Bansal, 2016, p. 1617)	Dual case study	Risk management through building organisaitonal resilience to counter risks in cross-border mergers and acquisitions (M&A)	Resilience as the main way for managing risks, mitigates risks that arise during cross-border M&A (input)	Financial, strategic and organisation, process	Conceptual outline of how organisational resilience can act to mitigate risks in a cross-border M&A project
Siltaloppi et al. (2019)	Organisation, individual (academia)	“... an organisation’s ability to absorb strain and preserve or improve functioning under adversity” (p. 4, following Kahn et al. (2018))	Case study at Aalto University, Finland	How do academics constantly find new ways to promote their agendas despite man-agement intervention	“Resilience as values-based resistance against managerial control” (p. 3) (behaviour)	Protective, independent and adaptive resilience	Three forms of resilience were observed: protective, independent and adaptive
Haase & Eberl (2019)	Startups	“organization’s capability to anticipate, prevent, and mitigate potential adversity prior to its escalation to secure an organization’s existence and prosperity” (p. 579)	Case study	Organisational resilience in the startup context: large organisations rely on embedded routines, young firms must enact <i>routinizing</i> to creating and maintaining such routines	Resilience being fostered through routinizing of routines / capabilities within startups (outcome, capabilities)	Anticipate, prevent and mitigate potential adversity	Certain startup-specific context factors hinder routinizing, e.g. time and personnel constraints (p. 591)
Michel-Villarreal et al. (2019)	Agri-food systems	Economic resilience; definition following (Annarelli & Nonino, 2016, p. 3)	Mexican Agriculture, Livestock, Forestry Census 2007	Resilience as one of the four sustainability pillars evaluated by the Sustainability Assessment of Food and Agriculture System	As the ability to generate a positive cash flow and maintain effective buffer (capabilities)	Investment, vulnerability, product quality and local economy (p. 282)	Definition of themes and subthemes of economic resilience (Figure 1, p. 282); comparison of two measurement tools (p. 286)

Table 10 – literature review summary XXXVIII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Jilani et al. (2019)	Organisation, SMEs, individual	“the ability of the organization to cope with modification through continuous replenishment of business operations to prevent deterioration and disuse” (p. 140, following Scott (2007))	239 Bangladeshi SMEs (SEM method)	Structural paths from organisational factors (such as creative climate and knowledge management) to individual employee resilience to organisational resilience	Organisational resilience (indirectly) and employee resilience (directly) impacted by creative climate and knowledge management (latent, outcome)	Creative climate and knowledge management as predictors of employee resilience and further organisational resilience	Creative climate, employee resilience and knowledge management significantly impact organisational resilience at different levels and they are shown to also be significant predictors of organisational resilience
Morales et al. (2019)	Organisation	“adaptation capabilities, survival, and response of the organizational structure to keep the system in operation” (p. 3-4)	159 Mexican manufacturing firms (SEM method)	Companies develop a resilience profile to either recover to equilibrium or new growth	Organisational resilience factors are identified (model on p. 4) (outcome)	Resilience leadership, organisational culture, capacity to organise and adaptation capacity	Resilience leadership influences culture and capacity to manage and organise operations (indirect), adaptation capacity has a direct impact on resilience
Ingram & Bratnicka-Myśliwiec (2019)	Organisation, family firm	“. . . as a dynamic, ambidextrous capability to recover from and positively adjust to an unexpected, adverse situation.” (p. 186)	193 Polish SMEs in the manufacturing sector	How is organisational resilience beneficial for the competitive advantage of the family firm? Organisational ambidexterity and dynamic capabilities theories	Organisational resilience linked to competitive advantage of the family firm	Community robustness and creative agility as <i>key duality</i> of resilience	Ambidextrous organisational resilience is positively related to the competitive advantage; Competitive advantage is fostered through rapidly and efficiently coping with adversity (p. 187)
Turgeon (2019)	Organisation, individual (leadership)	“. . . emerging from the crisis stronger and more resourceful than prior to the crisis” (p. 54)	30 managers and educators (delphi study)	Required leadership skills to promote organisational resilience in the post-crisis phase	Organisational resilience being built through leadership skills post-crisis (outcome)	Postcrisis vision, view crisis as a catalyst, positive adjustment, . . . (p. 115)	Identified skills: (a) adaptable, (b) communication, (c) transparency, (d) personal mastery, (e) learning and (f) emotional intelligence

Table 10 – literature review summary XXXIX (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Werran (2019)	Organisation, food sector	“... ability to adapt – to continually innovate, learn and improve — in order to manage uncertainty and risk and seize those new opportunities” (p. 26)	Conceptual (viewpoint)	Organisational resilience in the food industry measured through the BSI organisational resilience index (The British Standards Institution, 2019)	Conceptual	16 core elements being ranked	Adaptive capacity seems to be an area for improvement in the food sector
Beuren & dos Santos (2019)	Organisation	“... organization’s survival by dealing with shocks, risks, and changes.” (p. 309)	144 managers of M&A involved parties (SEM method)	Understanding the role of enabling and coercive management control systems (MCSs) in creation and use of organisational resilience capacities (p. 307)	MCSs as antecedents of resilience capacity (capacity, output variable)	Conceptual orientation, constructive direction, improvised agility, behavioural preparation, psychological security, network (p. 314)	MCSs as antecedents of resilience capacity in organisations; organisations seek to manage dynamic tensions, e.g. balancing efficiency versus experimentation (p. 318)
Bang et al. (2019)	Organisation	First, organisational resilience with stable institutions and second, capacities to absorb shock, learn from and adapt and recover better from an event (p. 268)	Semi-structured interviews with disaster managers in Cameroon	Physical and social vulnerabilities relative to organisational resilience and adaptive capacity	Adaptive capacity via the evaluation of vulnerabilities and organisational resilience (p. 267, 269) (outcome, corresponding with adaptive capacity)	Coping/recover, crisis management, (non)-structural measures and organisational and community resilience (p. 276)	Institutional performance for flood management in Cameroon is ineffective, flood management legislative framework is weak and simply the government’s “negligence, incompetence and corruption” (p. 279) are at fault
Al-Ayed (2019)	Organisation	Summary of various definitions (e.g. Lengnick-Hall et al., 2011; Mallak, 1998; Somers, 2009; Youssef & Luthans, 2007)	449 staff responses from private hospitals	The impact of strategic human resource practises on organisational resilience	Resilience in cognitive, behavioural and contextual dimensions (outcome)	Cognitive, behavioural, contextual organisational resilience	Strategic human resource management practises are observed to have an impact on resilience; strategic aspect most influential (p. 183ff)

Table 10 – literature review summary XL (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Carmeli et al. (2020)	Organisation	Summaries of various definitions presented (Sutcliffe & Vogus, 2003; van der Vegt et al., 2015)	Conceptual	How can financially and sustainability driven organisations translate negative and positive performance gaps into resilience? (p. 154)	Different search behaviours promote or limit behaviours that further resilience (outcome)	Social and environmental resilience and financial resilience (p. 156)	Both promoting (internal search) and limiting (vicarious search) behaviours can improve resilience
Mitsakis (2020)	Organisation	Human resource development (HRD) resilience as a new success element that can, with other elements, enhance organisational resilience	Conceptual	HRD as organisational change leader, can additionally contribute to organisational resilience through strategies and policies (p. 322)	HRD resilience as one potential success element of organisational resilience	Conceptual	Conceptual outline of the definition of HRD resilience and the integration of such with organisational resilience theory as one of the potential success factors
Karman (2020)	Organisation	“... ability to resist and respond to an external shock and recover once it has occurred ...” (p. 276)	61 survey responses from European firms	Resilience is built through the application of various resilience mechanisms in response to weather extremes	The frequency and depth of application of various mechanisms varies	Extreme-related, organisational, community, individual factors (p. 278)	Various mechanisms frequency (p. 284) and significance (p. 285) was analysed; overall application level was a significant predictor of adaptive resilience
Cruickshank (2020)	Organisation	“... ability to function during a shock and then return to normal function” (p. 1)	Conceptual	Resilience not as a reserve capability that is called upon when crisis arise; proactive view of resilience	Anticipatory innovation (Teixeira & Werther, 2013) as the main driver (outcome, capacity)	Conceptual	Proactive view of resilience; introduction and integration of anticipatory innovation as main driver of resilience (p. 8)
Hillmann (2020)	Organisation	Various definitions summarised	Conceptual, systematic review	Various lenses summarised	Conceptual	Conceptual	Five broad disciplines summarised: ecology, safety and reliability, engineering, positive psychology and organisational development, strategic perspectives

Table 10 – literature review summary XLI (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Senbeto & Hon (2020)	Individual	“... employees’ adaptability and intention to manage changing market demand.” (p. 4)	298 + 78 employee responses in service, Ethiopia	Ongoing challenging dynamics; employee resilience as mediator variable	Employee resilience mediates between turbulence and innovation (mediator)	9 item measure of employee resilience (p. 9)	Employee resilience partially mediates the relation between turbulence and service innovation (Fig. 2, p. 12)
Santoro et al. (2020)	Organisation, family firms, individual, entrepreneur	Resilience from two perspectives: (1) capability to withstand shocks and (2) capability to develop new capabilities and growth	Survey with 195 small family firm managers	Resilience in the entrepreneurship context; different levels of analysis of resilience are investigated	Relation between employee resilience and performance moderated by entrepreneurial resilience (input, moderator)	Employee resilience (cognitive, behaviour, context) (p. 8), entrepreneurial resilience (p. 9)	Employee-level resilience positively affects performance when there are higher levels of entrepreneurial resilience
Beech et al. (2020)	Organisation, family firm	Various definitions summarised; “... resilience ... needs to be tempered to accommodate the system” (p. 173)	Conceptual	Resilience in the family firm context; how do familiness and e.g. relationship dynamics impact performance?	Conceptual	Conceptual	Familiness mediates between organisation and individual, which is theorised to mediate between organisational and individual resilience
Conz & Magnani (2020)	Organisation	Resilience as “... a firm attribute that evolves in time” (p. 401)	Conceptual, systematic review	Dynamic perspective of resilience and increased emphasis on the temporal dimension of resilience	Conceptual	Conceptual	Reconceptualised framework of resilience (dynamic view); two paths outlined: absorptive and adaptive (p. 409)
Gracey (2020)	Organisation	“A people-centric capability based on the strategic coordination of organisational resources, adaptive leadership, intelligence, communication and staff development which enables the identification and analysis of strategic threats ...” (p. 320)	Review of military documents from 2004 to 2016	Based on observations from the military and drawing on academic study, the authors is outlining the development of a common organisational resilience model;	Resilience as the enabler for awareness, agility business planning, business governance, business development (p. 323)	Corporate culture maturity, strategic corporate vision, adaptive leadership framework (p. 323)	Organisational maturity framework (ORM) tool (p. 323)

Table 10 – literature review summary XLII (continued)

Study	Unit of analysis	Definition of Resilience	Data	Theoretical lens	Treatment	Measurement	Outcome, main results
Beuren et al. (2020)	Organisation	Amongts others, Lengnick-Hall et al. (2011)	161 managers of Brazilian firms involved in M&A	The effect of managerial control systems (MCS) on psychological empowerment and organisational resilience	Resilience influenced by the enabling perception of MCS through increased managerial motivation (outcome)	Enabling MCSs favor the empowerment of managers which resilience (p. 218)	The results indicate a relation between the enabling perception of MCS and psychological empowerment as well as capacity for organisational resilience
Filimonau & Coteau (2020)	Organisation, desitnation (tourism resilience)	“... a destination’s ability (DM1) to adapt, learn, and self-organize following disasters (DM2; . . .), thus offering an integrated management vision (DM2).” (p. 207)	Tourism destination Grenada	The integration of disaster management with destination management principles to enhance destination resilience (Fig. 2, p. 210)	The successful integration depends on stakeholder collaboration (outcome)	Proactive, collaborative ways of disaster management	Local tourism stakeholders are aware of the potential threats but fail to develop measures and resilience
Sweya et al. (2020)	Water supply organisations in Tanzania	“... the ability to adapt, the need to detect the drift toward failure or weak signals, the organization’s preoccupation with failure, and the level of organizational reliability” (p. 7)	32 member panel in water supply sector in Tanzania (delphi study)	Organisations need to prioritise and allocate resource efficiently and effectively to develop resilience; a focus on service coverage rather than resilience created vulnerability	Resilience as the outcome of various factors (outcome)	E.g. awareness, emergency response plan, learning about resilience, leadership (p. 17)	Various factors emerged as factors influencing organisational resilience (p. 14-15)
Duchek (2020)	Organisation	“... resilience is a fundamental organizational ability that is directed toward organizational advancement. It enables firms to withstand stresses, continuously innovate, and quickly adapt to changes.” (p. 238)	Conceptual	Capability-based view of organisational resilience	Conceptual	Conceptual	Capability-based view of resilience that suggests three stages of resilience: anticipation, coping and adaptation (p. 223ff) which in combination with various underlying capabilities (p. 225ff) form organisational resilience (p. 224)

Appendix C – propositions summarised (Chapter 2)

Table 11 – propositions: summary of propositions

	Proposition	Impact on
Antecedents	Proposition 1a Instability of the environment	<i>the more instable the environment (volatile, disruptive, turbulent), the more likely the firm will engage in the development of potential RESCAP capabilities.</i>
	Proposition 1b Number of disruptions	<i>the higher the number of disruptions over time, albeit less-intense volatile environments, the more likely the firm will engage in the development of potential RESCAP over time.</i>
Amplifying (moderates)	Proposition 2a Prior experience	<i>the higher the level of prior experience, the more the positive relationship between disruption and the development of sensing capabilities will be amplified.</i>
	Proposition 2b Slack resources	<i>low levels of slack amplify the positive relationship between disruption and the development of opportunity seeking capabilities while high levels of slack impede the positive impact of disruption on the development of opportunity seeking capabilities.</i>
	Proposition 2c TMT attention	<i>the higher the TMT attention orientation on sensing activities, the more the positive relationship between disruptions and sensing will be amplified.</i>
	Proposition 2d TMT attention	<i>the higher the TMT attention orientation on explorative activities, the more the positive relationship between disruptions and exploring will be amplified.</i>
Integrating (moderates)	Proposition 3a Corp. coherence	<i>the higher the level of corporate coherence, the better the focal firm can realise the potential RESCAP.</i>
	Proposition 3b Firm size	<i>the larger the firm, the more resources a firm can deploy and redistribute and thus the better, quicker and more efficiently the firm can realise its potential RESCAP.</i>
	Proposition 3c Organisational flexibility	<i>the higher the level of organisational flexibility, the better the focal firm can adapt processes, structures and strategy to better realise potential RESCAP.</i>

Table 11 – propositions: summary of propositions II (continued)

	Proposition	Impact on	
Resilience Outcomes	Proposition 4a Potential RESCAP	<i>the better developed potential RESCAP, the more the firm will outperform competitors and prior levels of performance through enhanced sensing and exploring capabilities. Firms with higher levels of potential RESCAP are better able to sense (weak) signals, to sense both opportunity and threat as well as seek new opportunities that allows for future competitive advantage.</i>	Performance
	Proposition 4b Realised RESCAP	<i>firms with well-developed realised RESCAP capabilities tend to more likely adapt to changing environmental conditions shaped by instability and disruption through enhanced flexibility and efficiency in asset (re) allocation. Firms with higher levels of realised RESCAP tend to better be able to exploit current and future assets as well as reduce risk and uncertainty through transformative action.</i>	Adaptation
Leveraging (moderates)	Proposition 5a Industry clockspeed	<i>at lower levels of industry clockspeed, the positive impact of RESCAP on resilience outcomes is amplified, while at higher levels of clockspeed the positive impact of RESCAP on resilience is negatively moderated as attention is drawn away from RESCAP to satisfy demands arising from high industry clockspeed.</i>	Impact of RESCAP on resilience outcomes
	Proposition 5b Industry innovativeness	<i>while at lower levels of industry innovativeness, the positive impact of RESCAP on resilience outcomes will be amplified through increased managerial attention being drawn to RESCAP, at higher levels of industry innovativeness, the more negatively will the positive impact of realised RESCAP on resilience outcomes be moderated.</i>	
	Proposition 5c Institutional support	<i>the higher the financial institutional support, the more the positive relationship between RESCAP and resilience outcomes will be amplified.</i>	

Appendix D – comparing conceptualisations and definitions (Chapter 2)

Table 12 – comparing prior and new conceptualisations and definitions

Issue	Traditional view of RESCAP	Reconceptualised view of RESCAP
Definition	<ul style="list-style-type: none"> ○ Resilience as the outcome of firm-level responses to crises ○ Resource-based view ○ Adaptability and flexibility ○ Threat-rigidity perspective ○ Shock absorption and robustness ○ Capability perspective 	<ul style="list-style-type: none"> ○ RESCAP is the capacity of a firm to recover from disruptions through development and deployment of sensing, exploring, seizing and transformative capabilities to produce a dynamic capability of the firm. ○ Emphasis on RESCAP as a dynamic capability of the firm
Dimensions	<ul style="list-style-type: none"> ○ Multiple dimensions discussed ○ Some works lack dimensional clarity as the focus is different (e.g. equilibrium perspective by (Meyer, 1982) in which resilience is the property) 	<ul style="list-style-type: none"> ○ Multidimensional construct with four underlying capabilities ○ Two distinct subsets (potential and realised) of RESCAP ○ Addition of exploring
Antecedents	<ul style="list-style-type: none"> ○ Resilience as proactive capabilities (Conz & Magnani, 2020) ○ Knowledge base (Duchek, 2020) ○ Assets & resourcefulness, dynamic competitiveness, learning & culture (Pal et al., 2014) ○ Endogenous and exogenous stressors (Riolfi & Savicki, 2003) ○ Perceptual stance, contextual integrity, strategic capacity, strategic acting (Kantur & Iseri-Say, 2012) 	<p>Disruption specific characteristics impact the development of RESCAP:</p> <ul style="list-style-type: none"> ○ Munificence, instability, complexity (Dess & Beard, 1984; Keats & Hitt, 1988) ○ Number of discontinuities over time (Rudolph & Repping, 2002)
Drivers	<ul style="list-style-type: none"> ○ Resource availability, social resources, power & responsibility (Duchek, 2020) ○ Stakeholders (Collier, 2018) ○ Prior work is mostly silent on drivers, moderators or boundary conditions 	<p>Three distinct sets of drivers:</p> <ul style="list-style-type: none"> ○ Amplifying: moderates the negative impact of disruption on RESCAP ○ Integrating: moderates the realisation of potential RESCAP ○ Leveraging: moderates the impact of RESCAP on resilience outcomes
Outcomes	<ul style="list-style-type: none"> ○ Resilience as latent outcome variable ○ Organizational evolvability (Kantur & Iseri-Say, 2012) ○ Performance maintenance & performance recovery (Collier, 2018) ○ Agility, flexibility (Conz & Magnani, 2020) ○ Cope effectively with unexpected events (Duchek, 2020) 	<ul style="list-style-type: none"> ○ Performance reversion ○ Adaptability of the firm

Appendix E – questions for interviews (Chapter 3)

Questions outlined below represent a sample of the questions used in the qualitative research interviews, conducted in a semi-structured manner.

I. Introductory questions

- What is your role within the firm and what are your responsibilities?

II. Disruption-specific questions (antecedents)

- What were disruptive events that shaped the past 12 months?
- How did you feel the shock, the disruption?
- What were the main impacts?

III. Questions on the amplifying effect on the impact of disruptions (amplifying)

- How did previous experiences shape your perception / behaviour?
- Did the company utilise excess resources? Can you provide examples?
- What does the TMT focus on? Did that focus change?

IV. Responses to disruptions Capabilities that allow for the development of potential

RESCAP

- What were the responses to the disruption?
- How does your firm purposefully scan the environment for changing dynamics?
- How is your firm thinking about possible future solutions, scenarios?

V. Questions on the integrating effects of firm characteristics (integrating)

- *Can you explain how the different parts of the business are related? Did this change?*
- *I'm interested in how the firm size impacted your decisions and behaviour?*
- *Can you elaborate on the way (i.e., flexibly) your firm reacted to disruptions and why?*

VI. Questions about the capabilities that enable the realisation of RESCAP

- *How is your firm making the changes in the organisation to respond crisis?*

- *How is your firm portfolio changing during and after a disruption?*
- *What are characteristics of capabilities that allow them to impact firm performance?*

VII. Questions about performance (outcomes)

- What are some of the reasons why the firm is performing at the current level?
- Have you been able to recover to previous levels of performance? Or outperform?
- Has your competitive advantage changed compared to prior to the disruption?
- How did you know you were on the right path?
- What were your aha-moments? Surprises?
- How do you feel about the disruption now?

VIII. Questions on the leveraging effect of industry characteristics (leveraging)

- How would you describe the level of change (technological and competitive) within your sector? (clockspeed) Do you think your competitors see the rate of change?
- Would you describe your sector as innovative? (Innovativeness)
- I am interested in how institutions (i.e. the government, region) has supported you over the last few months. Has this changed compared to previous periods?

IX. General questions

- What advice would you give other firms in a similar situation?
- How would you handle a disruption if you were the CEO / manager of another firm?

Appendix F – list of interviews (Chapter 3)

Table 13 – list of interviews

#	Case firm	Role in the firm ²⁰	Level in firm ²¹	Location of informant ²²
1	SteelCo	Head of Global Operations	C-1	Austria
2	SteelCo	Member of the Management Board	C	Austria
3	SteelCo	President Asia Pacific	C-1	Singapore
4	ServCo	Head of China office (Beijing)	C-1	China
5	BioTech	Chief Production Officer	C	Thailand
6	Conceptual	Associate Partner	C-1	Austria
7	BioTech	CEO and co-founder	C	Thailand
8	BioTech	CTO and co-founder	C	Thailand
9	SteelCo	Divisional Head of Benelux	C-3	Netherlands
10	ChemCo	COO, Member of the Management Board	C	France
11	SteelCo	President North America	C-1	Canada
12	BioTech	COO	C	Singapore
13	ChemCo	President and CEO Americas	C-1	US
14	ServCo	Head of Philippines office	C-1	Philippines
15	Conceptual	CEO and founder	C	Austria
16	ServCo	Head of Thailand office	C-1	Thailand
17	ServCo	Head of South Korea office	C-1	South Korea
18	ServCo	Head of Hong Kong office	C-1	Hong Kong
19	SteelCo	Global Head of Marketing and Sales	C-1	Austria
20	Conceptual	Innovation and Start-Ups Manager	C-2	US
21	ChemCo	Exec. VP Strategy, Member of the Management Board	C	France
22	ServCo	Head of Singapore office	C-1	Singapore
23	ChemCo	Managing Director and Regional Manager SE Asia	C-1	Singapore
24	Conceptual	CEO	C	Germany
25	Conceptual	Professor of Strategic Management & Leadership	-	Austria

Total number of participants: BioTech (4), ChemCo (4), ServCo (6), SteelCo (6), Conceptual (5)

²⁰ Role in the firm is a description of the informants role, rather than the exact title of said role

²¹ The level within firm describes the level of hierarchy that the informant holds: C = CEO, COO, CTO, CPO; C-1 = reporting to C-level; C-2 = reporting to C-1 level; in cases where this could not clearly be determined, an assumption was made

²² It seems important to note the location from where the informant participated in the interview as this implies the cultural context in which those statements were made; this however shall not represent any inference to the demographics (i.e. that persons' origin or citizenship or race) of the participant or firm information

Appendix G – emerging concepts (Chapter 3)

Table 14 – concepts, description and exemplary statements: Disruptiveness

Theme	Description	Exemplary statements from transcripts ²³
1A. Crisis as catalyst	Crises are often described by informants to act as a catalyst for pre-existing dynamics. Rarely, informants outline dynamics that are purely and only induced by the disruptive environment. Important to note is that accelerated or intensified dynamics are not always negative for the firm.	<p>Technological change is mainly coming from digitalization, of course, and also artificial intelligence on and those things, and this is happening faster than it was before course [001]²⁴</p> <p>This was maybe not new in the pandemic, but I would say we could see that this has become more important during the pandemic . . . I would say not to because, but it has underlined the importance even once more. It was already important before, of course [003]</p> <p>I actually, look at Covid as a very positive disruption. Actually, 'cause it allowed us to actually take stock of where we are. Reflect on who we are as a company, what our core strengths are and where we want to go [005]</p> <p>I think [...] those basic trends have been existing already before the pandemic problem, and now they've been intensified [...] the pandemic accelerated some of those impulses, that's for sure and are forcing companies into [...] decisions they would have not considered before the pandemic that these decisions are necessary at all [006]</p> <p>We [had] not started to discover digitalization at the day of the crisis. But we were already embarked on the [journey, but with accelerated is more the speed or momentum [...] a crisis enables you to accelerate [010]</p> <p>Most of what we are seeing is an acceleration because the trends have been there [...] at least not a major change that has been caused by COVID-19 and was not there before [025]</p>
1B. Increased uncertainty	The disruptive environment in particular increased the level of uncertainty for firms. Uncertainty that manifests in a variety of issues (further outlined in category 2, impact of disruption)	<p>This is now getting much more uncertain, getting much more unprecise because the people you have, the market system they are working in is, facing the same uncertainties. [...] cannot justify decisions based on assumed facts. Whichever likelihood of only less than, let's say 10 or 20%, that means on the other side giving that as a fact, the companies have to learn to decide under uncertainty, and certainly also the risk involved [...] will increase [006]</p> <p>A lot of uncertainty and a lot of disruption, and that's been a huge [...] challenge for us in the last 12 months [011]</p> <p>Well I think uncertainty is probably the one thing that we fear most. 'cause we are like. A company like us is not just [company]. There are many companies like us, but you know. Making changes and yeah. You know it. You called manoeuvre as if you were on the bicycle and decide to turn left or turn right or to go back. Um? So we hate uncertainty, and the crisis with when it brings initially is uncertainty [021]</p>

²³ Exemplary statements were selectively chosen and were copied from the transcripts verbatim

²⁴ The informants who made the respective statement are noted in [brackets], for example [001] represents informant 1 in Table 14, Appendix G

Table 14 – concepts, description and exemplary statements: Disruptiveness (continued)

Theme	Description	Exemplary statements from transcripts
1C. Underlying dynamics	Informants detailed a number of underlying dynamics, that were accelerated and intensified, examples of which are given in the description	<p>In the first wave I thought there is going to be a shift away from global economy to more local business, but I changed my mind in the meanwhile nothing that's not going to happen. I think the global value chains are that strong that they have. They have not been interrupted heavily and they are not going to be interrupted heavily [006]</p> <p>For example here in this crisis it was obvious that it was a unique opportunity to accelerate digital transformation of the company [010]</p> <p>Another [...] really critical transformation initiative that's taking place across the industry is sustainability [013]</p> <p>The digitization topic is actually already very old, so talk of this trend of this megatrend digitization at least already 10 years rather longer [015]</p> <p>The [...] climate, crisis continues. Of course, questions such as "How does digitization affect my business model? Of course, questions such as global migration continue. [...] issues such as global migration or climate will perhaps have a much greater impact [024]</p>
1D. Nature of the disruption	Statements relating to the nature of the disruption, suggesting a differing impact of the disruptive environment contingent upon the nature (or source) of the disruption	<p>It was basically a worldwide [...] sanitary crisis, which basically hit everybody. Of course, depending on where your position is a chain you're hit slightly differently, but it's not like if you experience a quite a crisis where you're hit because you have an accident internally, or whether you have an issue with some of the product or whether you have a cyber-attack or whatsoever [010]</p> <p>The trigger was different. This was a health crisis rather than an economic crisis [011]</p> <p>And when we talk about current disruptions like covid, so it's not a technology, so that is not the disruption in the sense of Clayton Christensen. So it's totally different things [025]</p>
2A. Changes in consumer behaviour	One of the ways how the disruptive environment impact firms is through changes in consumer behaviour	<p>Before you said you have to look at the watch and you have to feel the touch or luxury cars and like s-class in China is now sold 90% via Internet [002]</p> <p>Covid's had a slowdown effect on some of our clients cause they weren't able to react as quickly as they could because other parts of their business was impacted by Covid, so that threw back their budgets [008]</p> <p>We were getting a call from a customer back in March saying, you know, I need to build a mould for [product]. Typically this is a 12 week build. I have to build it in 12 days so I need you to deliver [product] to me this afternoon when we might typically take [...] two weeks. So speed is one thing [011]</p> <p>Changes in consumer behaviour. Changes in shopping behaviour those consumers that first started to shop online will continue shopping online [025]</p>

Table 14 – concepts, description and exemplary statements: Disruptiveness (continued)

Theme	Description	Exemplary statements from transcripts
2B. Changes in decision making behaviour	Another way how the disruptive environment impacted firms is through changes to the decision-making behaviours	Speed before perfection is maybe good synonym speed before perfection [003] Anyway, by definition you never have enough information, so you can always find the excuse that you need additional elements, additional calculation documentation and what you see is that sometimes this is used as an excuse to delay decision and to protect yourself so whatever you do at a certain point in time, somebody's got to say it's enough. Now it's time to decide there's enough rationale [010] The second topic is how our managers make decisions, even in moments of total uncertainty, because no one knew what was going to happen [024]
2C. Reconfiguring distributive work	A major impact that the disruptive environment induced is the notion of a change in way of working	I mean the work, the work life is changing dramatically and people are working from home. [...] nobody thought of that a year ago that it's possible at [company] to work 100% from home and now it's widely accepted [001] The disruption for every business activity I could witness in Morocco still last year and also here in China, we're dealing with that every day is the practical impossibility to make business travel [004] What we did do, for example, is reduce the number of days that we work in the lab and switch to working home [...] Yeah, yeah for sure, and it's something that never [...] would have crossed my mind if we weren't forced into that circumstance [005] Obviously Covid has had a big influence on our the way we do our business. It's [...] very different now to wait was let's say 18 months ago where we were in a system where we travelled a lot [008]
2D. Demand disruption	Statements that detail the impact of the disruptive environment on demand in a variety of ways, e.g., a reduction in demand, increase in demand volatility	And, the biggest difference is that we did not have a market anymore. During the other crisis we had the market and everything was just homemade. Now there was all customers shut down [002] What you see is that the demand from the market has dropped [009] The fluctuation in demand was very important, not for very long, but very important [i.e., negatively significant]. What was the most probably the most difficult thing to handle is uncertainty [...] People are very often very much influenced by the context in the short term, there was very soon a belief that the crisis was to stay [021] Huge impact of course first of all on the demand [...], which has suddenly brutally collapsed [024]
2E. Supply disruption	Statements that refer to the impact of the disruptive environment on the supply side of the business (i.e., supply chain disruptions)	There are other [phenomena], for instance like the [...] incredible increase in transport costs between China, Europe and the US [004] Essentially what that did for us was really disrupt our supply chain. Because most of the consumables that we buy we purchased from local distributors, but they are actually imported [005] You know there is no movement [in the] supply chain. We have problems shipping the material [to] our customer and had problem[s] receiving the material [023]

Table 14 – concepts, description and exemplary statements: Disruptiveness (continued)

Theme	Description	Exemplary statements from transcripts
2C. Reconfiguring distributive work	A major impact that the disruptive environment induced is the notion of a change in way of working	<p>I mean the work, the work life is changing dramatically and people are working from home. [...] nobody thought of that a year ago that it's possible at [company] to work 100% from home and now it's widely accepted [001]</p> <p>The disruption for every business activity I could witness in Morocco still last year and also here in China, we're dealing with that every day is the practical impossibility to make business travel [004]</p> <p>What we did do, for example, is reduce the number of days that we work in the lab and switch to working home [...] Yeah, yeah for sure, and it's something that never [...] would have crossed my mind if we weren't forced into that circumstance [005]</p> <p>Obviously Covid has had a big influence on our the way we do our business. It's [...] very different now to wait was let's say 18 months ago where we were in a system where we travelled a lot [008]</p> <p>People happy to work from home because you know it might cost them. Yeah I don't know. Bit of extra air Con or something but they're saving a lot on traveling on lunches on coffees, on work, clothes [012]</p>
2D. Demand disruption	Statements that detail the impact of the disruptive environment on demand in a variety of ways, e.g., a reduction in demand, increase in demand volatility	<p>And, the biggest difference is that we did not have a market anymore. During the other crisis we had the market and everything was just homemade. Now there was all customers shut down [002]</p> <p>What you see is that the demand from the market has dropped [009]</p> <p>The fluctuation in demand was very important, not for very long, but very important [i.e., negatively significant]. What was the most probably the most difficult thing to handle is uncertainty [...] People are very often very much influenced by the context in the short term, there was very soon a belief that the crisis was to stay and if you had a demand of let's say 100 before dropping at 70 overnight, almost [...] OK, yeah, and the thesis was that there had to be a reset demand, the demand reset concept [021]</p> <p>Huge impact of course first of all on the demand [...], which has suddenly brutally collapsed [024]</p>
2E. Supply disruption	Statements that refer to the impact of the disruptive environment on the supply side of the business (i.e., supply chain disruptions)	<p>There are other [phenomena], for instance like the [...] incredible increase in transport costs between China, Europe and the US [004]</p> <p>Essentially what that did for us was really disrupt our supply chain. Because most of the consumables that we buy we purchased from local distributors, but they are actually imported [005]</p> <p>You know there is no movement [in the] supply chain. We have problems shipping the material [to] our customer and had problem[s] receiving the material [023]</p> <p>This means that we had to ensure that the production and supply chains were stable for the future. What does that mean in a bipolar market I really have to look very closely at what suppliers are there who might also fail because of this situation? [024]</p>

Table 14 – concepts, description and exemplary statements: Disruptiveness (continued)

Theme	Description	Exemplary statements from transcripts
3A. Intensity of the disruption	Statements that describe the intensity of the disruptive dynamics. Dimensions include prevalence (both geographical and firm-level impact), duration of the disruption, sequence of disruptions (Rudolph & Repenning, 2002)	<p>But one year later, there was there was 9/11 when you remember, it was 2001. This was basically one year after the .com bubble burst and this made the crisis even more severe than it was before. I think the crisis wouldn't have been so bad when 9/11 didn't happen [001]</p> <p>With Covid, it's probably the first time where everyone, regardless of what field they are in, what industry they're in and everyone around the world is kind of like facing a crisis at the same time [005]</p> <p>So this time is much more dramatic. There are only [...] very few sectors which take advantage [016]</p> <p>Well, I think the Corona Crisis is [...] second to none. So actually I have never seen so dramatic changes within such a short period of time [017]</p> <p>I see the whole world, you know, being kind of hostage of this health crisis with the Ups and Downs, but everyone suddenly has to cope [...] with the same yeah [018]</p>
3B. Previous disruptions	Statements that compare the current disruptive environment with previous disruptions defining a variety of characteristics essential for comparison, leading to a further characterisation of the disruptive environment	<p>Two major disruptions apart from this one. This was obviously the global financial crisis in 2009, which was from nature a bit different because it came from the from the financials side, but from the consequences quite similar and I remember very well the first of the of the .com bubble in 2000, so this was also a major disruption [001]</p> <p>I think maybe [...] in the in the in the in the past I mean there once the [...] other big disruption that I came across was the financial crisis in 2008 [014]</p> <p>When we had the 2008 2009 crisis, I remember this very well at the very start it was totally unexpected, never happened before [021]</p>
3C. Speed of disruption	Statements referring to the speed of induced changes and the acceleration or intensification of such speed of changes	<p>Different here was now the speed in which this crisis has spread across the globe. I believe this is something we have not seen before and we had to deal with a lot of different topics in a matter of hours or days to find some quick emergency solutions [003]</p> <p>Speed of of the disruption we had was far quicker than normal [011]</p>

Table 15 – concepts, description and exemplary statements: Sensing

Theme	Description	Exemplary statements from transcripts
4A. Observing the environment	Statements relating to the abilities of the firm to observe (i.e., sense) the environment for dynamics that might impact the firm. Dimensions include proactive sensing, listening to customers, ability to predict, scenario planning and stress testing.	<p>I think we have also of this crisis, we have learned that we need to be much more proactive in sensing out possible disruptive technologies or disruptive developments, referring to our business [003]</p> <p>But I want to listen as much as possible to what I hear from my customers from my team. That's what I want. What are the drivers and this public opinion for me is less important than you know the noise around it [009]</p> <p>Your ability to navigate it has a direct correlation in terms of your ability to anticipate it or to see it coming. You know if it arrives on your doorstep at, you know 8:01 in the morning on Monday, then you're in far worse shape than if you know you saw it coming you know six months before [...] I think we've been much more invested in strengthening our external focus and in the US we invested very specifically [...]o enable our commercial people to have the right information at their at their hands [...] So you know, they could help make decisions. Be more responsive [013]</p> <p>This is something that banks are doing for [...] like adverse scenarios and all this and [...] I think it's something that every company should [...] think about, is stress testing [020]</p>
4B. Risk management	Statements that detail the way how firms do risk management in disruptive times and the importance of such. Inference is made also to the notion of firm size, in that firm size might determine the way risk management is done purposely	<p>Which is risk Management today and probably even more in crises [...] risk management is vital. You need to not so much to gamble necessarily about what the future is going to be rather than to have a scenario-based analysis and see in terms of risk. What makes more sense, knowing that nothing is risk free? You cannot be totally be risk adverse, but you need also to manage your risk and to figure out what happens if you make a big mistake. For me this risk management is sometimes more important than the budget per se [010]</p> <p>I know there's companies now that have these risk assessment or risk management or and the you know you with all the money in the world you have people to, especially to do this kind of stuff, but we you know we're two were too small for that. We've been too lean for being able to do things like that [012]</p>
5A. Assessing	Statements that explain the firms' ability to make sense of the signals in the environment. Here, informants also details ways of how they try to make sense of the disruptive dynamics in the environment	<p>Looking at raw material prices makes sense that'll maybe understand disruptions, in particular when there is a development what is simply not reflecting real world, what is simply a crazy development [001]</p> <p>Uncertainty is, is it a trend? A do we have to adapt to this trend or is it another hiccup? [...] And so the [...] name of the game is to [...] see the trend and disregard the noise. [...] So making the difference between the signal and the noise and today more which depending on who you talk to [021]</p> <p>And so if we now take the volcanic eruption, relatively early to decide. That sounds, if you look at it backwards, always very simple, to decide relatively early, does that have an impact on my business model yes or no? [024]</p>

Table 16 – concepts, description and exemplary statements: Exploring

Theme	Description	Exemplary statements from transcripts
6A. Finding new opportunities	Statements that detail the way how firms find new opportunities in times of disruption. This concept entails a number of dimensions, such as business model innovation [003], formulating strategy for the future [005, 007], M&A activities [006], where can current capabilities be redeployed [008], new business acquisition [019]	<p>So that's why we try to keep all the market channels all the let's say, existing market activities, but we add up new ones, so this is also kind of transformation [002]</p> <p>I would say starting at the last quarter of last year and we are looking intensively into new business models. We could interact our customers with [003]</p> <p>it's like only the best will survive. You know somehow because they are, they are still active, although they are hindered in doing their business. They really prepare a strategy for the aftermath [004]</p> <p>Whereas if that disruption didn't really happen, I think you get so busy in your day-to-day work you don't get that opportunity to like sit down and plan [...] trying to figure out like OK, what next? Like what do we do? And then from there I think we actually came up with the. A very good strategy that is going to lay the foundation for like the next phase of our company [005]</p> <p>Now, if you are in a business environment where you have the chance to buy a competitor in March 2020 as an answer to the development of this of this disruptive revolution then you would probably say, well, let's wait till October. Maybe I get him cheaper. [...] That means this kind of yes, I am aggressive, but the opportunity might be even cheaper in the future. I might buy a competitor. It's at out of bankruptcy eventually even, and by just the machines and the people from the market [006]</p> <p>We got now in types of capabilities that other companies could utilize that may not lie within our normal core area, [...] and those can also be used for other things. So there are a lot of companies out there who are looking for new locations where they could have a company like ours manufacture just [product] but just [product] for yeah, [...]. So that was a chance for us because this was a new opportunity in the market we have the facilities [008]</p>
6B. Cultivating new relationships	Statements specifically relating to the notion of acquiring new relationships that detail the changes to the ways this is done. Informants detail the challenges that the reconfiguration of distributive work has brought, and the changes firms' make accordingly. This also denotes a new way of customer acquisition is done by firms	<p>Can we establish a virtual contact which in the end leads to a concrete business? OK well create contract. Yeah will we succeed to bring business partners together virtually? And then we agree on effective and concrete business contract [004]</p> <p>If you looking for new partners and there is more difficult because you don't always get those sort of subliminal signals. As is my message coming across or not, it's more difficult when you see somebody meet for the first time on[line] [007]</p> <p>How do you? How do you create now this kind of [...] business relationships? [...]there's a company that that was that is still focused on having their [...] employees, you know, meet customers so they actually are a fine with them. Traveling going into quarantine for two weeks just to, you know be somewhere then and then meet people for a week. So I think that's a different also different kind of commitment [014]</p>

Table 16 – concepts, description and exemplary statements: Exploring (continued)

Theme	Description	Exemplary statements from transcripts
7A. Path finding	Statements that relate to more longer-term strategising in response to the disruptive dynamics, that are distinct from finding new opportunities as strategising is inherently longer-term and more strategic in nature than finding new opportunities	<p>There will be opportunities which were unthinkable before this pandemic, which might be something which is now on the table, which you might look at and say, well, why not? Let's go that way. Let's extend into the value chain for example or target new markets with new competence, which I have. So proactive transformation [006]</p> <p>Thinking, and I take the third thing we did was think take the opportunity to not have to run it around airports and catch trains and airplanes and things to sit down and think in a much more holistic manner. Where can we move the business? Yes, will get better. Let's say part of the revenue stream to us [008]</p> <p>I think the basic principle [...] has been shown to us again, how important it is, simply to deal with the future and simply to ask in principle which topics have how strong an effect on my industry, but also on the industry in my target markets [015]</p> <p>That is a major discussion here, and this is really going on because there are many tourism resource that say we cannot continue how we have done tourism business in the last years and we have to reposition ourselves. We have to change our strategy, so I think in this industry [025]</p>

Table 17 – concepts, description and exemplary statements: Buffering

Theme	Description	Exemplary statements from transcripts
8A. Ensuring liquidity	Statements that emphasise the importance of ensuring firm liquidity, that is an appropriate cashflow, optimised working capital and capital expenditure in times of disruption. This concept is related to the notion of slack resources, where the availability of such resources might have an impact on response formulation	<p>We reduced the investment budget and this is survival mode [002]</p> <p>To the most, the things you don't really need, you have to ask yourself, what do I need to survive? And you reduce according to the necessities and possibilities to the strict minimum, which would guarantee that you survive [004]</p> <p>I would spend more time in in finding those reserve resources which I would need in the case that something goes completely wrong. So these, contingent resources which you need to remain in the position where you can act where you are not forced to react to something which is out of your control [006]</p> <p>So you started cash conservation without losing your essential core activity abilities so. That was the first thing to get [008]</p> <p>We've tried to do immediately and obviously and you start immediately to evaluate the short term risk starting with the liquidity risk [010]</p>
8B. Keeping operations running	Statements referring to the firms' activities ensuring ability to operate and produce. Dimensions of this concept include external dynamics that force a closure of operations, the commercial implications and the criticality of the operations for the firm and the public	<p>Then we tried to keep open all our operations [002]</p> <p>The focus of the key management team changed to keep the operations going [003]</p> <p>Yes, so if we talk about the financial services sector in New York City, even as a financial service industry is a critical infrastructure, especially within large banks, you need to have a trading floor active [020]</p> <p>When it is time to get organized, to invest and to get prepared to, you have to build up your inventory. You have to reduce your inventory. You have many decisions to make and you haven't certainty, so you don't know if you will be having a recovery in the [redacted] market anytime soon same for the other markets have to get prepared [021]</p> <p>Also, under the aspects given in Lockdown 1, do we continue production, do we have to separate production [024]</p>

Table 17 – concepts, description and exemplary statements: Buffering (continued)

Theme	Description	Exemplary statements from transcripts
9A. Communicate and motivate	Statements emphasising the importance of the ability of firm managers to adapt communication behaviours and the ability to motivate employees in times of disruption. Dimensions include internal communication and motivation of employees, stakeholder communication, sharing of knowledge within the firm	<p>So we let's say we transfer the plans and the action plans from Singapore or China to 1st Italy [...] Let's motivate people in terms of how we lead people and what is leadership in times like these. The precise question was like which leadership principles to be apply until we can travel again [002]</p> <p>You have to motivate your people and not putting negative [redacted] over the people all the time [009]</p> <p>there's a lot of management involved in keeping everybody's morale up [012]</p> <p>One element in all of this is key and key is a communication is key. OK so you can be a startup you or even in like existing large Corporation. OK, usually as a startup you get more credit from the public [020]</p> <p>Because we believe communicate communication is very important. So we started to prepare ourselves [...] the company is that first we make sure that the spirits, the spirits of people, the. People are not being demotivated because already we are in a crisis where the in order when people don't go out [023]</p>
9B. Nurturing customer interactions	Statements defining how firms changed their way of nurturing existing customer relationships as a consequence of the disruptive dynamics. Dimensions include the channels used (e.g., digital vs. face-to-face), the level of intimacy with customers, prioritisation of interactions	<p>Also we recovered in that respect, and now we're back with the personal visits between 3000 and 4000, but we have additional up to 11000 thousand calls, we record [002]</p> <p>You have to keep in mind that we could not visit the customer now so everything was done there in the digital way [003]</p> <p>Your intimacy with your customer base. And this can be a key differentiator if you know, uh, the people you do business with is certainly much easier than if you don't know and here you also see a limit in the digitalization [010]</p> <p>I'm a firm believer that the interactions with our customers will not return the way there were. Of course there will be a an opportunity for face to face visits, but they will be less frequent in my opinion, and they'll be less tolerance from customers for the type of sales call [011]</p>

Table 17 – concepts, description and exemplary statements: Buffering (continued)

Theme	Description	Exemplary statements from transcripts
10A. Enacting implementation (advancements)	Statements that describe the way how firms implement changes. Dimensions include the method of implementation, speed and risk-taking involved (i.e., speed of change)	<p>What we typically would do? Would be we would take a few people, 1-2 maybe 3. We would, people we have confidence in. We would challenge them to engage the organization, the rest of the organization and build followership right and build excitement build followership, build a willingness of people to say I'm prepared to invest in your idea [013]</p> <p>Judging by the character of the last crisis. Many of the initial changes were quick and dirty [020]</p>
10B. Step-by-step approach	Statements that describe how firms have enacted changes, adaptation step-by-step. Dimensions include temporal dependence, contextual dependence and managerial focus (i.e., the ability of the management to shift their attention focus)	<p>I told my team is its first cut, second one is survive and the third point is rebuild [002]</p> <p>So, cutting down our costs in a in a way which wouldn't affect our ability to carry on and be productive. Then looking at where unused capacity isn't trying to use that also for other things outside our central. And finally trying to look at the whole value chain and see what else can we do it downstream of what we have to do with other partners which will bring us more income [008]</p> <p>First, our first steps were focused on the health and safety of our employees back in March [...] of course it moves on to business continuity seeing the majority of our market close in April, May and June because the automotive industry shut down, so then it was focused on, you know, business continuity [...] then recovery after August when things started to recover. It was then a case of how do we ramp up our business at the same pace to ensure that we can continue to service our customers. So there's been different stages [011]</p> <p>First liquidity and if you if you have enough liquidity and if you know that you can survive then you can think about strategic issues [025]</p>

Table 18 – concepts, description and exemplary statements: Reconfiguring

Theme	Description	Exemplary statements from transcripts
<p>11A. Strategic change (pivot)</p>	<p>Statements that detail how firms enact strategic changes to their firm strategy, some even engaging in pivot during times of disruption</p>	<p>I mean I would go as far as to say that we've almost pivoted the company to a different direction completely [005] But a lot of revenue generation is downstream of that. So when you've actually made the product and you're going to the consumer and saying we're selling the product for consumers, there's a very large revenue, yes, ability there, which we weren't really cashing in on up to now [008] But let's just take this to the next level and see how we can pivot our business model and actually [...] not only react to crisis but then also pivot into crisis and in order to actually turn this into maybe something even better [020] Yes, even in the pharmaceutical sector, we now see completely different players that we hadn't heard of before. One of them is our customer [name]. They had their entire research facilities organized before as a laboratory, now converting into a company that brings in money for the first time yes, they didn't have a product on the market before. That means therefore, you need now a completely different organization [024]</p>
<p>11B. Diversification</p>	<p>Statements that re-emphasise the importance of diversification for resilience performance of firms in disruptive times. Dimensions of diversification include customer size and financial stability, geographies, product portfolio, market segment and position in the value chain</p>	<p>Geographic footprint as we are in the position that when China was down, we still have good business in Europe and the United States. And then when the pandemic arrived in Europe and the United States, China already was working like it was before, almost. So we had quite of a smoothing of the of the effect of the pandemic [001] We always proclaimed over the last years is to get a little bit away from the complete dependence of the European market to more diversify to overseas markets [004] So, besides our core activities, which are still our main focus, we're bolting on these extra things around our power kind of center thing to generate more revenue to generate [008] I strongly believe that one key factor to remain robust to deliver resilient results is diversification. At the end of the day, the over dependence on one specific country, sector, end usage, a customer makes yourself very vulnerable [...] So I think it's very important not to rely on only one pillar. We can debate how many you should have, but at the end of the day, this is what keeps you alive [010] I mean my experience or my how to say my result of the covid dynamic is actually to really build up a strong local presence in time. So that you can rely on a local partner local agent [016] I think one big strength of our companies would be very diversified. We operate in a lot of different segments [...] the regional diversification has helped a lot [019] In fact, we have a rather diversified portfolio of products applications [...] geographies yeah, which means that unless the whole economy is collapsing, this is what we have seen in October 2008 yeah so then everything goes down at once. No warning, no notice. And we had the demand all over the place all over the place, dropping by 30%. OK, yeah. Um, in the case of a pandemic, it was different. Like you before we had some market or where we have proven to be resilient [021]</p>

Table 18 – concepts, description and exemplary statements: Reconfiguring (continued)

Theme	Description	Exemplary statements from transcripts
12A. Restructuring of the organisation	Statements relating to changes of the organisational structure, that are changes to organisation, hierarchical structure, footprint, personnel	<p>So, we did a lot of restructuring. We closed a lot of locations [002]</p> <p>So basically, reduced our footprint in [country] to just focus on our laboratories and that saved us a lot of cash, which is important in in these times [008]</p> <p>For me it's simply how do you build organization? What's my understanding, how does something work? And I think I need the logic there, that decision-making hierarchy should never be structured in such a way that everything goes to the top decision-making level, but I actually need to enable many members of the organization so that they are able to develop cool solutions themselves [015]</p> <p>I mean we did some rationalization, so we closed down several of the offices we [...] reduce the footprint [019]</p>
12B. Network activation	Statements relating to the notion of firm- and personal-networks in the ecosystem of the firm. This concept entails multiple dimensions, such as network breadth and depth, network strength, ability to activate the network when necessary, the quality of the within-firm network. An important notion is that of co-creation as part of network activation, therefore part of the distributive capabilities of the firm	<p>What is also new is there was a lot of interaction between different in different segments so [...]So a kind of global team, from different segments and different industries. This was also new. New approach and this also helped a lot because people so that they are not alone and this is this was thanks to the development of the communication tools. This wouldn't have been possible in 2008 nine and it would have been impossible to arrange in 2001 [002]</p> <p>But I strongly believe that the quality of the networking is part of the assets of the company and people and today's world tend to undervalue [010]</p> <p>I think you know also is very, very fundamentally driven by connectivity to your organization [...] think another capability is frankly, how would I say intimacy you know, organizational intimacy and communication. And probably one of them. Is fundamental in communication is active listening [...] So I think you have to organize your networks. Both externally and internally to facilitate information flow [013]</p> <p>I would rather much more focus on co creation and being closer to customers and also other partners at the end of the day trying to build up a network of Co creation of innovation. Do we need to be able to do test very quickly also to success [019]</p> <p>These are all stakeholders in any good company. In order to secure a feasible like disruption plan should have stakeholder map and should know whom to call in crisis and should not call those people meant the crisis happen but should maintain like frequent communications with their stakeholders [020]</p>

Table 18 – concepts, description and exemplary statements: Reconfiguring (continued)

Theme	Description	Exemplary statements from transcripts
<p>13A. Developing parallel capabilities</p>	<p>Statements describe how firms develop and deploy in-part contradictory capabilities in parallel, that is e.g., the focus on short-term survival and future business outlook of the firm concurrently. Dimensions include the ability to manage contextually different issues (e.g., survival vs. future growth), objectives in decision making (e.g., speed and rationale)</p>	<p>But to generate these excess funds, you need to reserve funds you need to make very quick and fast, you had to make very quickly fast decisions, and this is a mix of a mix of capabilities if you like, which is not usual [006]</p> <p>So, managing this balance between speed and rationale something critical, and it's up to the management to reassess this [...] What shall we do? Should we cancel this strategy update and focus only on the daily business? The answer actually was finally to change a bit the format, but to stick with the date to transform the event which was supposed originally to be a one and half day face to face event [...] transform it in a 2 hour or three-hour virtual meeting, which actually was very successful. Where despite the crisis we were able to explain what was of 2024 objectives or five-year vision [010]</p> <p>You know it's as a as a someone in a leadership position obviously the pandemic has been the primary focus, but it cannot be the only focus of the management and you know you need to still think about the other things that are out there. The other growth projects that we have underway [011]</p> <p>One of the key feature of what we did was we need to have a two-fold mind to manage the crisis and prepare the future [021]</p>
<p>13B. Stimulating agility</p>	<p>Statements relating to the managements' ability to stimulate agility in the firm in disruptive times.</p>	<p>Something I've been very proud with and think we've been able to be very, very agile in this period. So stimulating agility was one of my major focus. Not necessary because I had to, but making people understand that there is no time so waiting cannot be the easy answer [010]</p> <p>I think in the world we live in, when I say mid-term, I'm talking like three years, not 15 years. [...] Because I think you have to have you know a flag in the ground that you know you continue to try and orient your organization towards doesn't mean you go in a straight line. The agility means sometimes you go to the northwest, other times you go to the Northeast. Hopefully all the time you're going North, but you do need to move [...] [013]</p> <p>When I say dynamics have, I need very agile organizations, so that you are able to quickly adapt when I notice that something is not working. That is of course from industry to industry different, agile is a stretchable term. That is of course something different than if I am now a brand manufacturer in the field of fashion items or industry, it's completely different, but in both cases of course it's about agility [015]</p> <p>I think it's fair to say that we are a centralized company. And there were a number of decisions that were made by the comex on the basis of you know things being reported to the [...] crisis committee. But at the same time there were many, many things decided at the local level because it's impossible [to do otherwise]. First, I think we have 140 production sites in the world and there is no way a group of eight people can decide on the day-by-day basis So, it was a real combination of decisions made at the top of a company decision and the local level within the business unit [021]</p>

Table 19 – concepts, description and exemplary statements: Situational moderators

Theme	Description	Exemplary statements from transcripts
14A. Managerial focus	Statements relating to the managerial attention focus within the firm. Dimensions include the focus on transformational, strategic aspects (e.g., new business models), the focus on operational issues (e.g., efficiency driven operations)	<p>Of course, we're not so much dealing with the new business models and new things. And, and we're more focused on how can we maintain the current business [...] It's a little bit in the other direction and I'm sure in in a years' time we're going again in the other direction as it's not dramatic [001]</p> <p>I think the action has surely overtaken proactive analysis in the first six months [...] I think in the second half we came back to what's key management is actually paid for, to look into the future [003]</p> <p>My personal belief is like in an ideal scenario, [...] the COO should be the one who's probably handling the day-to-day and then the CEO is just thinking about the long term [005]</p> <p>I think it's um strengthened things slightly in anything that we still talk about. We spend time strategizing that maybe more than we did before [007]</p> <p>The focus in your management team becomes over more to costs [009]</p> <p>during the crisis you don't have you, you don't have enough time to do both. So first you have to focus all your energy on liquidity. So there is usually there is no time and there are many companies that have strategic potential is that have new business models emerging and then comes to crisis and they see now we have to stop these strategic activities because we have to focus on survival [025]</p>
14B. Prior experience	Statements describe the role of prior experience in formulating and enacting responses in disruptive environments. Dimensions in this concept include path dependency, learning (i.e., experience), the impact of prior experience and accompanied learning	<p>We had all of these factors influencing us. Uh without a history without a knowledge base, I mean typically 90% of the decisions we make on a day-to-day basis. I believe even probably even higher than 90% there is a foundation of history to that decision [...] for the first time in our lives, we had a management team of a dozen people who none of us have been through this before [011]</p> <p>You know it's just the knowledge that however tough things get, that is possible to come out the other side is and experience having done that before is an important component of that for sure [012]</p> <p>It definitely has advantages and disadvantages because if you have prior experience in a crisis you know how to react and you are probably better able to react soon, to react sooner, you probably react stronger because. You know how harmful a crisis can be. Um, and you also probably know which measures can be taken. [...] digitalization is it is a major topic, probably younger managers have more ideas or are more willing to change [025]</p>
14C. Slack resources	Statements referring to slack resources (e.g., excess cashflow) that firms can draw back on. Important contingencies are e.g., firm governance type	<p>I would spend more time in in finding those reserve resources which I would need in the case that something goes completely wrong [006]</p> <p>If you as companies that that were easier to adapt, they have a stronger financial base, they had a stronger source of internal funding, so when you have already an established business model, your revenue funded [...] and then of course we ideally also have reserves to like weather a crisis [020]</p>

Table 19 – concepts, description and exemplary statements: Situational moderators (continued)

Theme	Description	Exemplary statements from transcripts
15A. Firm governance & size	Statements explaining the impact of firm characteristics on response formulation. Dimensions include firm size (that is both number of employees and size of fixed assets), firm type (i.e., governance) and hierarchical structure of the firm	<p>We are a public listed company, so we have to report quarterly figures. So we are not in a position to say OK, so pandemic will last for a year for a year. I don't make any profit and forget everything and after the year OK, we start off again [001]</p> <p>OK, I mean. I think this situation would have been much tougher if I was handling a bigger company. OK, yeah, so I think definitely having a small team worked in our favour [005]</p> <p>The other USP, that I'd say we have, is that we were small facility. That means that our costs are a little lower [...]What I've learned from all this is there must be a balance of a size of company. Which is the best to work with? I mean, it's certainly more than 12, but it's probably less than you know 600 [008]</p> <p>So, very hierarchical structures I think are not really useful, for adopting quickly [019]</p>
15B. Organisational culture	Statements relating to the impact of organisational culture on resilience behaviour of the firm. Dimensions include cultural distance and firm culture (e.g., is willingness to change engrained in the firm culture)	<p>And I see also it huge difference in cultures, country wise [009]</p> <p>But it is also a weakness because we don't bring in enough people who want to think differently who want to disrupt our organization when you have a group of people who already think about the way things have always been done, it's hard to change. When you bring people in who think differently, have a different idea, different vision, and give them a voice [011] (firm culture impacted by the diversity of the team)</p> <p>Another interesting dynamic is that I think as a global company, the strength of the signal on different aspects will differ, of course [013]</p> <p>Especially South or East Asia like Japan, South Korea, a country where personal relations are very important [017]</p>
15C. Team cohesiveness	Statements describing how team dynamics affect firm-level behaviour. Dimensions include the change in team closeness and the impact of team closeness (e.g., the better you know your team members, that is, the higher the level of trust among the team members, the easier adaptation might be)	<p>So just this is this was it was it was tying us closer together [002]</p> <p>But when you know people very well as well [...] you probably don't really need [to meet face-to-face], you know you know each other well enough, and you can tell from the picture of the boys if somebody is happy with her decision or not happy [007]</p> <p>The dynamic of our management has also changed. We have become closer as a management team. From a communication standpoint from a best practice sharing standpoint from a knowledge management standpoint [011]</p> <p>Change in a good way, I would say you know, changing in a way that I think we we're closer basically I will objective and our principle. Actually, the getting the title and then more the inclusive, than exclusive [023]</p>

Table 19 – concepts, description and exemplary statements: Situational moderators (continued)

Theme	Description	Exemplary statements from transcripts
16A. Government support	Statements that describe the impact of firm-environmental characteristics. Dimensions include financial support (both direct and indirect) as well as strategic governmental support (e.g., the push of the Singaporean government for certain firms to pivot into new sectors and markets)	<p>We had lots of support from the government, obviously, so we had this short-term work makes life much easier [001]</p> <p>Rebound must be seen different because there is a lot of political actions to let's say to minimize the effects of the pandemic on one side and on the other side there is the regional and local, the local performance [002]</p> <p>A lot of governments came to the party and supported us in quite a few countries, and I believe the same is true in Austria and other European markets [003]</p> <p>The only support we really got entitlements and we got our reduction in our rent [007]</p> <p>If you look at the Singaporean companies, but this was also due to the help from the government is huge transformation process [...] That thing was government. It was government, giving them incentives, telling them OK. If you in this industry you get a support until the end of the year and by the end of the year if you haven't changed or did anything the financial support is gone [022]</p>
16B. Innovativeness & clockspeed	Statements referring to the impact of market characteristics. Dimensions include the level of (regulatory and innovative) change, market maturity (established vs. emerging)	<p>I would say high level of change for sure because it's a constantly evolving industry and if you don't adapt you're going to fall behind. In terms of like equipment that you use in manufacturing is changing all the time. So like every five years almost you need to get in new equipment to be able to do what you need to do. And like products that are being made are getting more and more complex so you know you need the tools and equipment to be able to make them and the regulations are evolving all the time as well, often to become stricter and stricter. [005]</p> <p>I don't think that's changed at all. Actually, I would say that's about the same. OK, obviously biology biotech, whatever is always been inventive and it's always constantly moving, as though someone claiming they've got the next best thing [007]</p> <p>Generally speaking at disruption as an act or as a as a risk or opportunity, yeah, more often than not it's in the emerging spaces. Yeah, competitiveness in the capability by which you manage your business is a good, in my view, at least is where you see the dynamics of change in existing markets. Not to say that disruption can't happen in an existing market. It certainly does. It's just a question of the intensity and frequency [013]</p>
16C. Physical resources	Statements relating to physical resources that enable firms to better create value and enhance adaptiveness. Physical resources include, production sites, plants, equipment, human resources	<p>We're running round about 140 hundred 30 locations worldwide [001] 140 sites in 40 countries with 30 languages and roughly 5500 people [002]</p> <p>We have like a small scale GMP manufacturing facility and an R&D lab [005]</p> <p>If you are more exposed downstream, it's much easier to cut cost because you have smaller plants, you have a batch process. You have a handy so you can adjust. In your constructure decrease your labor not necessary in proportion to the decrease of sales, but at least a bit more in proportion than if your upstream in the chain [010]</p>

Table 20 – concepts, description and exemplary statements: Resilience

Theme	Description	Exemplary statements from transcripts
17A. Competitive advantage	Statements relating to how firms measure competitive advantage as a measure of success in disruptive times. Dimensions include a change in market position (i.e., market share), stronger company (i.e., competitive advantage has improved), change in business model (e.g., value proposition), strengthened customer relations, sustainability (beyond ecological sustainability)	<p>Did we gain market share? How do we fare against our competitors? We have list of competitors which we always benchmark ourselves against [003]</p> <p>Yes, I think those who are ready to take new risks who trying to seize the opportunities they will be in a better situation than before. Yeah, provided to have survived [004]</p> <p>Expand the services that we offer [...] and like we've managed, I think to find a niche in the market. We previously didn't realize that we could capitalize on [it] [005]</p> <p>Probably if you end up in a stronger market position, whatever this position is defined of, it means if your position in the market has strengthened either because you had a longer breath than your competitors, or you had a better customer relation which you nurtured during this stage [006]</p> <p>I mean, so the combination between share price and sustainability performance, which includes, by the way, diversity talent management and so on and so forth is part of it, so if you want to be long term successful you need certainly to have a good share price or good valuation, but also to be attractive to people. So people need to think that you're good company to work for [010]</p> <p>You know is you look at some of your core markets and you evaluate your position overtime? You know we have several markets today that are extremely dynamic [013]</p> <p>And I think what happens is how you react to the disruption and how you react to mega trends make it make it successful in the end is really how open you are to change how open you are to innovation, how willing you are to innovate yourself [014]</p> <p>Securing supply chains and market access, and on the other hand, how does it actually look with the people and my own employees [...]and on the other hand, what public expectations are there [024]</p>
17B. Employee retention	Statements explained how employee retention can be a measure of success in disruptive times	<p>So if you put off your most qualified people, you might not be able to get them back. Once business can be done again, you know if you have as a famous restaurant with the Star Chef and you say to your Star Chef well and your customers come because of him, and if you put off your star chef and when you open again you don't have him anymore, then you might not have the same attractiveness to your clients [004]</p> <p>We didn't have to like let go of any staff, the fact that we throughout the whole time did not need to reduce anyone's pay [005]</p> <p>First because he's very skilled workers and you cannot, you know, layoff these people and have to hire them back three months later. It's impossible [021]</p>

Table 20 – concepts, description and exemplary statements: Resilience (continued)

Theme	Description	Exemplary statements from transcripts
17C. Financial performance	Statements outlining measures of financial performance. Dimensions include positive financial result (this could be net income, profitability), sales & marketing performance (e.g., new customers acquired),	<p>Our business year starts in with April 1st and ends on March 31st and we managed to be over the whole period above the zero line [002]</p> <p>I wouldn't say we're in survival mode, so I mean if I look at our business figures, we're actually doing this year better than in the pre covid year [...] another benchmark is profitability [...] KPIs maybe change going forward you get more and more into new business ideas or different business logic. Maybe some of the KPIs I have mentioned now need also to be revisited in the next couple of years. [003]</p> <p>We're just looking at basically how many leads we acquired during this time and how many of those were going to close this actual projects [005]</p> <p>I think we were I mean successful, I think that's been evidenced by we've got new clients or partners, customers [007]</p> <p>You know I'm very I'd be very simplistic and at the end of the day, especially with public listed company and it will be the share price [010]</p> <p>I mean disruption basically, paves the way to look at success on a more broad range [020]</p> <p>The key driver again is cash generation. Who is at the end of the day just for survival standpoint [021]</p>
17D. Increased efficiency	Statements detailing the increase in efficiency as one of the success metrics firms are observing. Dimensions include improved cost efficiency, time efficiency, increased efficacy of communication	<p>But on the other side and I'm gaining a lot of efficiency if I'm sitting at home and doing some kind of [...] without having to travel 4 hours [...] and this positive effects on efficiency [006]</p> <p>For the moment, we're taking the upside of having a huge saving in the in the in the monthly budget by not having a lot of these things [012]</p> <p>A form of doing export business specifically abroad when it's very time consuming and in the end expensive to travel all the time. Also, the companies have learned a lesson we have seen that certain parts of their business can be done virtually can be done digitally remotely. I think that's the essence [016]</p> <p>Video conference call is like 1000 times less expensive then then a flight to a certain country. And if one can see OK I have more or less the same outcome or more or less the same result. So why bother stepping into a plane? [017]</p> <p>On the other hand, communication become much more efficient because [...] we don't have to waste time on traveling. You spend less money as well. At the end of the day, we also can communicate often easier between Countries [019]</p>
17E. Survival	Statements referring to the notion of survival detailed by informants as one of the main components of resiliency outcomes	<p>I think the 1st and important thing is the survival that the company can survive and then tries to make out the best of the situation [004]</p> <p>if you don't survive, you don't save the cash for the only survive and all the other side. Then you have a better position in market [006]</p> <p>One of the biggest problems at the moment so if someone can survive, this is a cash flow problem [017]</p>

Table 20 – concepts, description and exemplary statements: Resilience (continued)

Theme	Description	Exemplary statements from transcripts
18A. Flexibility	Statements detailing how success can be measured as a form of flexibility (implied transformability, ability to act quickly and decisively). Dimensions include structural, strategic and operational flexibility (that is, have these changed over time)	<p>Some changes are improvised and, on the spot, and out of the necessity [004]</p> <p>Yeah, and that's how you can measure a company how flexibly they are if they will be successful, yes or no [009]</p> <p>At which speed you can adapt yourself to a situation [010]</p> <p>You have to quickly change depending on the opportunities [012]</p> <p>As I mentioned the beginning, I think the most successful ones were the ones who moved early into digital [016]</p> <p>The challenge with the disruption is there is there are no reliable forecasts here and you don't really know. What is going to happen when it is going to happen and so it is extremely difficult to have reliable indicators and this is, I think this is the main characteristic of this disruption. And that means during a disruption you must be able to manage without reliable indicators. So there's. Uncertainty in every aspect and even the aspect of how do we know that we're going the right direction? [025]</p>
18B. Preparedness	Statements that describe the notion of preparedness (i.e., being prepared for changes in the environment and act quickly in accordance). Dimensions include structural (that is e.g., organisational structure), financial (that is financial stability, i.e. have enough cash to be able to act in crises) and strategic (e.g., the notion of a diversified portfolio, the notion of sensing and exploring the market) preparedness	<p>But what would be different now that we would be much better prepared because we have now structures, in place and what every company should have anyhow [...] We would be much better prepared [003]</p> <p>At the end of the day, it's a very important checking point in the list of things that need to be monitored and better to do it before the crisis and when it's not too late because you cannot change the profile of the company all of a sudden. If you're not prepared the ground, then it's probably hopeless [010]</p> <p>That you know you have to be ready for even the most crazy circumstance that you could never even think of. Yeah, none of us knew that I knew that you know, 18 months ago that that we would be in in a pandemic and it would affect everything we do [011]</p> <p>Yeah, exactly. And I think the better you position yourself in now in in tackling that, the future, the better is it [014]</p> <p>For me resilience is a topic I am prepared and prepared [...] how can I be prepared [...] I deal with the big trend fields to understand where are fields where I need to make preparations? [015]</p> <p>Sometimes you have hiccups, sometimes you have bumps and having it and it was so in fact the most important things to weather the crisis has been done before [021]</p>

Appendix H – codebook (Chapter 3)

Table 21 – qualitative study: codebook from data analysis²⁵

Name	Files	References
A Disruptiveness	25	191
01 Triggers	20	71
1A Crisis as catalyst	11	28
1B Increased uncertainty	3	6
1C Underlying dynamics	18	33
1D Nature of the disruption	4	4
02 Impact of disruption	23	82
2A Changes in consumer behaviour	5	6
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2C Reconfiguring distributive work	20	44
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03 Temporality	21	38
3A Intensity of disruption	15	25
3B Previous disruptions	8	9
3C Speed of disruption	3	4
B Sensing	13	32
04 Scanning	12	23
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05 Sensemaking	5	9
5A Assessing	5	9
C Exploring	21	55
06 Opportunity seeking	20	51
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6B Cultivating new relationships	5	6
07 Strategising	4	4
7A Path finding	4	4
D Buffering	22	82
08 Maintaining	14	32
8A Ensuring liquidity	12	20
8B Keeping operations running	6	12
09 Levelling-up	15	32
9A Communicate and motivate	9	14
9B Nurture customer interactions	11	18
10 Pacing	13	18
10A Enacting implementation (advancements)	9	11
10B Step-by-step approach	5	7

²⁵ Status of analysis: April 2021

Table 21 – qualitative study: codebook from data analysis (continued)

Name ²⁶	Files ²⁷	References ²⁸
E Reconfiguring^{29, 30}	21	86
11 Diversifying	17	36
11A Strategic change (pivoting)	7	7
11B Diversification	12	29
12 Resourcing	14	30
12A Restructuring of the organisation	9	14
12B Network activation	8	16
13 Fungibility	9	20
13A Developing parallel capabilities	9	15
13B Stimulating agility	4	5
F Situational Moderators	24	105
14 Cognitive-Amplifiers	15	35
14A Managerial focus	12	21
14B Prior experience	6	12
14C Slack resources	2	2
15 Decision-Enablers	17	39
15A Firm governance & size	14	25
15B Organisational culture	8	9
15C Team cohesiveness & trust	5	5
16 Resource-Levers	17	31
16A Government support	10	16
16B Innovativeness & clockspeed	8	10
16C Physical resources	5	5
G Resilience	24	90
17 Value creation	22	67
17A Competitive advantage	17	26
17B Employee retention	5	6
17C Financial performance	13	23
17D Increased efficiency	7	7
17E Survival	5	5
18 Adaptiveness	17	23
18A Flexibility	12	13
18B Preparedness	8	10

²⁶ Name of code representing a first- or second-order concept or a construct

²⁷ Number of documents (i.e., interview transcripts) where this code has been used

²⁸ Number of instances where this code has been used across documents

²⁹ A, B, C, D = constructs, 01-12 = second-order concepts, 1A-12B = first-order concepts

³⁰ Numbers are cumulated at the next highest level

Appendix I – analysis of coding per interview (Chapter 3)

Table 22 – analysis of coding per interview³¹

#	Group	Role in the firm	References ³²	Coverage ³³
1	SteelCo	Head of Global Operations	33	25.75%
2	SteelCo	Member of the Management Board	26	30.08%
3	SteelCo	President Asia Pacific	27	15.41%
4	ServCo	Head of China office (Beijing)	24	30.06%
5	BioTech	Chief Production Officer	29	42.79%
6	Conceptual	Associate Partner	28	62.49%
7	BioTech	CEO and co-founder	22	33.63%
8	BioTech	CTO and co-founder	25	44.19%
9	SteelCo	Divisional Head of Benelux	18	22.53%
10	ChemCo	COO, Member of the Management Board	36	53.72%
11	SteelCo	President North America	37	32.69%
12	BioTech	COO	22	36.66%
13	ChemCo	President and CEO Americas	18	42.23%
14	ServCo	Head of Philippines office	17	32.32%
15	Conceptual	CEO and founder	24	22.12%
16	ServCo	Head of Thailand office	18	38.18%
17	ServCo	Head of South Korea office	21	39.51%
18	ServCo	Head of Hong Kong office	26	55.08%
19	SteelCo	Global Head of Marketing and Sales	38	47.27%
20	Conceptual	Innovation and Start-Ups Manager	19	37.23%
21	ChemCo	Exec. VP Strategy, Member of the Management Board	25	57.65%
22	ServCo	Head of Singapore office	21	44.31%
23	ChemCo	Managing Director and Regional Manager SE Asia	24	26.91%
24	Conceptual	CEO	23	15.63%
25	Conceptual	Professor of Strategic Management & Leadership	17	26.64%

³¹ Average references per interview: 24.72, Average coverage per interview: 36.60%

³² *References* denote to the number of instances of coding per document

³³ *Coverage* refers to the percentage of text coded in each document, that is including questions by PA

Appendix J – secondary data for triangulation (Chapter 3)

Table 23 – secondary data examples (inductive study)³⁴

Source	Exemplary statements from transcripts	Interpretation
Interim report ³⁵	[...] programs aimed at cost optimization, [...] adjustments in personnel [...] declines [...] within limits. Restructuring [...] carried out [...]. The use of [government support] partly [absorbed temporary declines in orders].	The firm focussed on buffering activities to absorb negative consequences of increased volatility on demand side of the business. Additionally, the availability of government support provided added (moderating) assistance
Interim report	[the firm’s diversified] positioning with a focus on [...] niche markets [was advantageous for the firm] The lockdowns also [created a huge] boost to the e-commerce [sector]	The diversified portfolio of the firm contributed to buffering of the negative consequences of disruptive dynamics. The diversified portfolio was in addition beneficial where sectors showed growth during disruptive periods
Interim report	Beyond the short term, [the firm pursues] to implement [the] strategy. Good progress has been made [to] sustainable transformation [...] social commitment.	While the firm focussed its attention on ensuring financial stability across the portfolio, the pursuit of the firm-wide strategy was done in parallel. This notion strengthens the idea of parallel focus on in-part contradictory notions, that is, buffering and transforming
Interim report	In order to mitigate [the firm] put in place measures to reducing its costs and its capital expenditure [...] compared with the amount originally planned. Moreover, the [firm benefits from] diversity of its end markets and geographic footprint	While focussing their efforts on buffering and mitigation, the firm recognises the importance of diversification across the firm-portfolio. Moreover, the interim report re-emphasised the importance of pursuing strategically important initiatives concurrent to buffering. However, what remains open is whether the concept of diversifying includes the ex-ante meaning of the state of diversification or it is the act of diversifying in times of disruption. Important to note is, that this might need to be viewed in conjunction with preparedness as mentioned in the interview data.
Press release	[the firm will] continue to implement its long-term strategy, major projects, targeted acquisitions and innovation initiatives [to achieve] sustainable development opportunities, as well as its strategic review	The firm details its initiatives to pursue strategy enactment in parallel to ensuring survival of the firm by project implementation, acquisitions and strategy formulation processes. The degree to which a firm is able to pursue both buffering and reconfiguring concurrently, may however be contingent upon a number of factors, such as the structure of the current balance sheet, that is, if the firm exerts exceptionally high attention to survival, reconfiguring might not be viable

³⁴ Excerpts from secondary data sources have been fully anonymized. To ensure anonymity of firms and, consequently, informants, extracts from those secondary data sources have been in-part loosely paraphrased herein or redacted. Information added by the author is denoted as “[text]”

³⁵ Mid-year or quarter financial reports of publicly listed firms, including financial performance and updates

Appendix K – approach, summary and results (Chapter 2 & 3)

Table 24 – summary of approach, theoretical lens, results across papers (Chapter 2 & 3)

Aspect	Conceptual paper (chapter 2)	Inductive paper (chapter 3)
Approach	Theory-driven	Inductive research
Theoretical lens	Dynamic capability view (Eisenhardt & Martin, 2000; Teece, 2007; Teece et al., 1997)	Contingency view (Hofer, 1975; Luthans & Stewart, 1977; Tosi & Slocum, 1984)
Based on (data)	Systematic literature review (initial 452 studies, final set of 168 studies)	In-depth qualitative interviews (25 interviews) Secondary data for triangulation
Summary	<p>A dynamic capability view of resilience enhances our understanding of how firms develop, deploy and nurture the capabilities essential to formulate resilience responses in times of disruption</p> <p>An understanding of the environmental conditions (Keats & Hitt, 1988) that constitute disruptive times and the capabilities that firms should develop to reverse firm-level performance and enhance adaptiveness of the firm</p> <p>The ideas of potential and realised resilience capacity represent a useful ground for understanding how firms develop and deploy capabilities that underpin resilience capacity</p> <p>Further, the moderating variables that impact the relationships within the model are grounded in the received literature and grouped by their impact in the model</p>	<p>A contingency-based view of resilience emerged as a result of the inductive research process. That is, a focus on the situational factors that constitute the firm environment contributes to a more nuanced view of how firms respond to disruptive environments</p> <p>Constructs emerged from the data analysis that describe the disruptiveness of the environment, dynamics, processes and capabilities that underpin resilience response formulation, situational moderators and resilience performance as measured by outcome variables</p> <p>The fluidity and dynamism of relationships within the inductive model warrant a contingency perspective to demonstrate how there is no one solution for resilient response formulation and enactment in disruptive times across firms</p>
Results	<p>The proposed conceptual RESCAP model differentiates between potential and realised RESCAP to achieve performance reversion and adaptiveness of the firm</p> <p>Extension of dynamic capability view through the addition of the inherently entrepreneurial explorative dimension of firm-level capabilities</p> <p>Identification of endogenous and exogenous factors that moderate the relationships within the model</p>	<p>An inductive-contingency-based model of firm-level resilience under disruptiveness that illustrates the capabilities, dynamics and processes that underpin firm-level resilience</p> <p>The contingency-based view of firm-resilience allows for a more nuanced and holistic view of how firms formulate and enact responses contingent upon situational factors and dimensions of disruptiveness, owing to dynamism and fluidity</p>

Appendix L – contributions and limitations (Chapter 2 & 3)

Table 25 – summary of contributions, limitations and future research (Chapter 2 & 3)³⁶

Aspect	Conceptual paper (chapter 2)	Inductive paper (chapter 3)
Contributions	<ul style="list-style-type: none"> ○ Dynamic capability view of resilience ○ Emphasis on disequilibrium as the focal research setting ○ Definition of dimensions of RESCAP ○ Addition of exploring dimension to dynamic capability view ○ Conceptualisation of potential and realised RESCAP ○ Multi-dimensionality of constructs ○ Integration of environmental conditional view of disruption 	<ul style="list-style-type: none"> ○ Contingency-based view of resilience ○ Dynamics and processes of resilience ○ Distinctiveness of sensing & exploring dimensions ○ Addition of Buffering construct ○ Firm resilience described as a recursive, dynamic and flexible concept through a contingency lens
Limitations		<ul style="list-style-type: none"> ○ Generalisability of findings ○ Potential endogeneity in model ○ Disruption-specific behaviour ○ Intention vs. intuition ○ Survival and recall bias
Future research directions	<ul style="list-style-type: none"> ○ Empirical (quantitative) study ○ Applying a different theoretical lens ○ Extending the dynamic capability view 	<ul style="list-style-type: none"> ○ Empirical (quantitative) study ○ Counter potential endogeneity ○ Non-disruption-specific behaviour ○ Analysing Intuition versus Intention

³⁶ An overview of general future research directions can be found in **Table 8** in the limitations of the thesis and future research section. The here presented limitations are narrower in scope and specifically concern the respective paper in Chapter 2 and Chapter 3

Appendix M – contingency theory in Strategic Management

A brief review³⁷. The below outline shall provide a succinct overview of contingency theoretical views in the strategic management domain. The contingency view re-emphasised in early work by Hofer (1975) on business strategy assumes a general view of “any theory of business (corporate) strategy must be a contingency theory” (p. 786). That is, the optimal strategy for a firm is contingent upon a set of environmental, situational and endogenous factors (Luthans & Stewart, 1977, p. 182). Consequently, this means that there is no optimal strategy or managerial practise across all firms, sectors and exogenous as well as endogenous factors. A contingency theoretical view, therefore, places emphasis on the contingent effect of environmental, and other, variables on the formulation and enactment of strategy.

Luthans & Stewart (1977) extend earlier views the discussion towards a general contingency theoretical view of management. A useful perspective for the development of such a general view was developed by Child (1974), who related the notion of situational variability in management to systems thinking. While the situational perspective was previously discussed in detail (e.g., Mockler, 1971) and related to open systems thinking in (Child, 1974). Luthans & Stewart (1977) expand upon earlier work that relates the situational view to open systems thinking and the universalist view to closed system thinking (Child, 1974), to arrive at a general contingency theory. That is, the general model of contingency in the management domain integrates primary, secondary and tertiary system variables (Luthans & Stewart, 1977, p. 186-189). According to this view, the general contingency perspective of system performance is contingent upon performance variables (integration of

³⁷ This summary shall only serve as a general overview of a contingency theory of the firm and by no means serves as a literature review. For the purpose of this study (Chapter 3), the focus lies on the basic tenets of contingency theory as the assumption that variables that are endogenous and exogenous to the firm impact strategy formulation and enactment (Hofer, 1975)

managerial and environmental variables), organisational variables (the integration of the management- and resource-subsystem) and the situational variables (resources and environment) (Luthans & Stewart, 1977, p. 187).

A way of determining the contingency effect of the environment was advanced by Dess & Beard (1984). The authors proposed a model of task environmental conditions, that are, munificence, dynamism and complexity, through collapsing the environmental conditions advocated in earlier work (Aldrich, 1979; Aldrich & Herker, 1977) by means of factor analysis. These studies, however, focussed on the environmental dimensions as the main contingent variables, while the stream developing the contingency theory of management (Child, 1974; Hofer, 1975; Luthans & Stewart, 1977) takes a broader view of contingency in the firm-context. The basic principles of contingency theory have been applied in a variety of settings such as corporate governance characteristics (Boyd, 1995), family business succession (Royer et al., 2008), leadership (Ayman et al., 1995; Fiedler, 1971), the management of firm resources (Sirmon et al., 2007) and alternative forms of structural fit (Drazin & Van de Ven, 1985).

Discussion. While in the early stages of contingency theory development in the management domain scholars questioned the basic tenets of the theoretical foundations (e.g., Schoonhoven, 1981), consequent work across various fields applied contingency theory to a variety of issues as outlined above. A contingency-based view of any issue in essence assumes an impact of the situational or environmental conditions of the firm, team or individual on the focal phenomenon and the relationships within these models. A contingency theoretical view therefore shall investigate how environmental and situational factors impact the formulation and enactment of firm-level responses under disruptiveness. The model shall therefore put particular emphasis on the impact on both response formulation as well as resilience as an outcome variable, measured by performance and adaptiveness.