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Bridging Organizational Resilience and Management Control Systems - A Systematic Review

Weber Max M.^{a} and Peter G. Rötzel^a*

^aDepartment of Accounting and Information Systems, TH Aschaffenburg, Aschaffenburg, Germany

*Correspondence Address: Max M. Weber, Department of Accounting and Information Systems, TH Aschaffenburg, Würzburger Str. 45, 63743 Aschaffenburg, Germany.

Email: maximilian.weber@th-ab.de

Abstract

Organizations have repeatedly faced challenges due to disasters such as pandemics, economic or financial crises, and other unexpected events. One reason why some firms cope more efficiently than others with such unforeseen circumstances might be found in their resilience design. However, while this has long been the subject of research, there is still no consensus in the literature, and there is no common understanding regarding the definition of the term, the conceptualizations of resilience at the organizational level, and its interaction with management control systems (MCS). This study bridges the MCS and resilience literature and provides a broader understanding of the relationship between the organization and adversity. Due to its ability to successfully control an organization and provide an effective control environment, we use Simons' levers of control framework (LOC) for integrating organizational resilience into MCS.

We perform a systematic review of analytical conceptualizations and definitions of management control systems (levers of control) and organizational resilience, supplemented by current empirical findings as well as a full citation network analysis. Based on the literature, we provide a framework which integrates organizational resilience into management control systems. Our findings show that the integration of resilience aspects into MCS enables firms to manage resilience at the organizational level.

Keywords: Organizational resilience, management control systems, levers of control, systematic review

1. Introduction

Prior research argues that an external crisis on the scale of the 2008 Global Financial Crisis (GFC) is unlikely to occur in the short term. Instead, other threatening and stressful events will occur and affect organizations (Iborra et al., 2019). In 2020, the world is facing one of the largest pandemics in recent history. The resulting economic consequences and effects as well as the probable duration of the pandemic are currently in no way foreseeable. The global COVID-19 pandemic has had a tremendous impact on organizations. In the context of this pandemic, the use and design of organizational resilience in order to survive and thrive is becoming increasingly important. Managing challenges and turbulences in a changing business climate requires developing organizational capacities to survive, adapt, cope and sustain. This makes the concept of developing organizational resilience contextual (Lengnick-Hall et al., 2011; Ruiz-Martin et al., 2018; Seville, 2008; Teixeira & Werther, 2013; Vargo & Seville, 2011).

Natural disasters such as the COVID-19 pandemic confront organizations in unexpected ways (Blyth & Mallett, 2020). Although such events can seriously jeopardize organizational performance and competitiveness (Burnard et. al, 2018), a crisis like the GFC offers opportunities for research that are not present in times of ‘normal change’ (Van der Stede, 2011, p.606). Managers often face situations in which organizations are affected by disruptions and negative risks, but their prior investment and efforts to prepare for crises do not pay off. It is an open question which organizations have a better chance of escaping the worst of the scenarios, mitigating the consequences, and minimizing the overall impact (Koronis & Ponis, 2018).

As Albert Einstein states, ‘in the middle of difficulty lies opportunity’ (Riker & Fraser, 2018, p.1881). Organizations have repeatedly faced challenges due to disasters such as pandemics, economic or financial crises, and other unexpected events. One reason why some firms cope

more efficiently than others with such unforeseen circumstances might be found in their resilience design. However, while this has long been the subject of research, there is still no consensus in the literature and there is no common understanding regarding the definition of the term, the conceptualizations of resilience at the organizational level (Annarelli & Nonino, 2016; Conz & Magnani, 2020; Duchek, 2020; Linnenluecke, 2017; Ruiz-Martin et al., 2018), and its interaction with management control systems (MCS). The question of whether organizations can use adverse events such as a pandemic as an opportunity to emerge from the crisis stronger is becoming increasingly important for both research and practice. It is likely that recent events and developments will have an impact on future resilience literature, as well as on future studies on the causes and consequences of major and recent catastrophes (Giancotti & Mauro, 2020; Linnenlücke, 2017).

In the last three decades researchers have developed and improved various conceptual frameworks for MCS and 'special' MCS. Examples of important MCS concepts are Simons' levers of control (LOC) (Simons, 1995b), which is still current in the management control and accounting literature, and the framework by Malmi and Brown (2008). As an example of a special MCS, Günther et al. (2016) developed an environmental MCS (EMCS), based on the Malmi and Brown framework. Malmi and Brown (2008) argue that 'building cumulative body of knowledge about the design and use of MCS becomes difficult without well-articulated definitions and purposes of MCS' (Malmi & Brown, 2008, p.289). The integration of MCS and organizational resilience is still lacking and there is also such a need for well-articulated definitions and purposes in the organizational resilience research.

In the literature on resilience at the organizational level there are a few, varying, reviews (e.g. Annarelli & Nonino, 2016; Barasa et al., 2018; Conz & Magnani, 2020; Duchek, 2020; Giancotti & Mauro, 2020; Linnenluecke, 2017; Koronis & Ponis, 2018; Ruiz-Martin et al., 2017). For instance, Annarelli and Nonino (2016) examine various definitions and specific

research domains of organizational resilience as well as their strategic and operational application. Ruiz-Martin et al. (2017) propose a four-level maturity model for organizational resilience, where the organization evolves over time, based on improvements in its abilities, characteristics or capabilities to deal with disturbances. Linnenluecke (2017) reviews different literature streams and the development of organizational resilience in business and management research over time. Conz and Magnani (2020) develop a new conceptualization (framework) that introduces a dynamic perspective regarding the resilience of firms. Duchek (2020) reviews various definitions and specific research domains of organizational resilience and develops a capability-based conceptualization (framework) for organizational resilience. Giacotti and Mauro (2020) offer initial approaches to provide a comprehensive overview of conceptual frameworks relating to the development and improvement of organizational resilience. None of the authors deals with organizational resilience in the context of MCS, except Koronis and Ponis (2018), who propose a framework for organizational resilience which is based on the existence of beliefs systems.

Bridging MCS and resilience may provide a broader understanding of the relationship between the organization and adversity. The question is whether, and if so, how it is possible to integrate organizational resilience into existing MCS in order to promote organizational resilience and, for example, to create sustainable competitive advantages. By integrating organizational resilience into management control theory, the resilience of the organization may be improved. It could also be a further step to answering the question of why some organizations are more resilient than others.

Our research aims to focus on integrating organizational resilience in management control systems, especially Simons' levers of control (LOC) framework (Simons, 1995b). Simons' innovation and control perspective is an established perspective on management control systems that is still current in the management control systems research (Journeault et al.,

2016; Martyn et al., 2016, Murray, 2018; Strauß & Zecher, 2013). Due to its ability to control an organization and provide an effective control environment, we draw on Simons' LOC framework for integrating organizational resilience into MCS. It is noteworthy that we cannot even find hints in the literature that Simons' LOC framework has been used by researchers in the context of organizational resilience.

The purpose of this paper is to use the LOC framework to examine the integration of organizational resilience into management control systems. This paper contributes in three ways to both management control and organizational resilience literature. The first contribution is that it bridges these two literature streams through a review of analytical conceptualizations and definitions of management control systems (levers of control) and organizational resilience, supplemented by current empirical findings as well as a full citation network analysis. The second contribution is that it develops a framework which integrates organizational resilience into MCS. Third, it reveals gaps between organizational resilience and MCS literature and provide avenues for future research. Accordingly, this review is a step towards closing gaps between the management control (levers of control) and organizational resilience literature to achieve the ability to deal with and manage resilience at the organizational level.

This review follows a transparent and thorough process aimed at improving scientific accuracy and building a reliable body of knowledge to complete previous reviews.

The remainder of the paper is structured as follows. In Chapter 2 we outline the research design and methodology we followed to search, select and analyze the publications. In Chapter 3 the results of the research are shown and we review the organizational resilience and the levers of control literature. In addition, we identify approaches to organizational resilience in the MCS literature (and especially the LOC literature), and vice versa approaches to MCS (and especially Simons' LOC) in the organizational resilience literature. In Chapter 4

we discuss the findings. Chapter 5 concludes the paper. We reveal the limitations of the paper and suggest approaches for future research.

2. Research Design/Methodology

Prior research on management control and resilience provides defined process steps and established procedures for performing a systematic literature review (e.g., Gregoire et al., 2011; Tranfield et al., 2003; Shepherd et al., 2015; Srivastava, 2007; Webster & Watson, 2002).

For conducting a systematic literature review to gain collective insights through theoretical synthesis into fields and sub-fields, we follow the research protocol in Figure 1, which is based on the guidelines proposed by Tranfield et al. (2003). This research protocol requires a description of the search strategy, the criteria for including and excluding sources, and the review process. We choose the guidelines from Tranfield et al. (2003), as these guidelines are already used in the relevant literature in the fields of MCS and organizational resilience (Ruiz-Martin et al., 2018; Strauß & Zecher, 2013).

To define the research questions and boundaries as well as the search criteria such as the relevant search terms in the literature, the first step of our research methodology is to get an overview of the relevant organizational resilience and MCS literature by conducting a so-called scoping study (Tranfield et al., 2003). Since a literature review provides a good overview of a specific research topic, we manually search for already existing reviews in the literature on organizational resilience and MCS. The results of this search are shown in Chapter 3.3 Resilience at the Organizational Level – A Summary and 3.4 Simons' Levers of Control – A Summary.

The first aim of our research paper is to summarize and categorize systematic reviews in the organizational resilience literature. In addition, our aim is to supplement the developed knowledge in the reviewed literature with the latest results of empirical and other types of publications. The second aim of our research paper is to summarize conceptual and empirical work based on Simons' LOC theory (Simons, 1995b). The third aim is to find approaches to

resilience at the organizational level in the LOC and MCS literature, and vice versa approaches for the use of Simons' LOC or MCS in the organizational resilience literature, and in literature in other contexts. Examples of lists of features that potentially characterize organizational resilience in Simons' work are given in Chapter 3.4 Simons' Levers of Control – A Summary.

In the first step of our research process, we define the following research questions: (1) How is organizational resilience defined and conceptualized in the literature? (2) How are Simons' LOC conceptualized and used in both conceptual and empirical literature? and (3) Are there approaches for organizational resilience in the LOC and MCS literature, and vice versa?

In the second step, we define the search criteria. In this context, we select the relevant databases for the literature search and define the search boundaries and the covered period as well as the search terms. We use the EBSCO (Business Source Complete) and ScienceDirect databases for the literature search, and define the field of business, management and accounting as the scope of our research. We are only looking for academic English-language publications, related to the subjects of business, management and accounting. Our selection of articles covers the period from 1980 to 2020 and includes both high- and low-ranked academic journals. We choose this period because Robert Simons published his LOC framework (Simons, 1995b) in 1995, which emerged from several publications Simons published in academic journals in the late 1980s/early 1990s (Simons, 1987, 1991, 1992, 1994, 1995a).

Based on the preliminary search mentioned above, we search for articles with the common search terms 'management control system(s)' (and) 'resilience' or 'levers of control' (and) 'resilience'. Due to the limited number of results, we decided to use additional keywords and searched the literature on organizational resilience and management control

systems independently. We select the keywords ‘organizational’ (or) ‘organisational’, (and) ‘resilience’ for the resilience literature at the organizational level (‘organizational’ is the US spelling; ‘organisational’ is the British spelling). For the LOC and MCS literature, we use the search terms ‘levers of control’ and ‘management control system(s)’. We tested other search terms such as ‘organization’, ‘enterprise’, ‘firm’, ‘resiliency’, and ‘resilient’, but those yielded less useful results.

In the third step, we define the exclusion criteria. We exclude all the papers whose title or abstract is not related to organizational resilience, MCS or Simons’ LOC.

In the last step of the research process, we check the references of the articles to find literature that did not show up in our search. In this step, we take into account the limitations of snowball sampling or chain referral sampling according to Biernacki and Waldorf (1981). In addition, we read and analyze the full articles to decide which studies become part of the final listing. Figure 1 shows the research protocol discussed above. Table 1 shows the number of results.

[Figure 1 near here]

[Table 1 near here]

To outline the most relevant publications, we perform a full citation network analysis of the total 155 publications found in the research process. We define relevant measures (e.g., *Eigenvector Centrality*) to show the interconnectivities and gaps within the research.

According to Vogl and Rötzel (2021), we structure the citation network analysis as follows: In the first step, we calculate metrics and other test parameters for the entire sample. Second, we draw the citation network using the *Force-Atlas-algorithm* from the Gephi software package (Version 0.9.2). Third, we modify the chart by using filters, size, and color manipulations that represent certain metrics. Finally, we interpret the results.

In order to prepare the input data for Gephi, we add the compressed literature list (155 publications) as *mother-nodes*, using their respective references of papers as *daughter-nodes*¹.

After uploading the publications into Gephi, we calculate the *HITS-metrics (Hubs Distribution and Authority Measurement)* according to Kleinberg (1999), the *Randomized Modularity* according to Blondel et al. (2008), the *Eigenvector Centrality* with 100 iterations and the *Average Path Length*. Table 2 provides an overview of the citation network analysis metrics.

[Table 2 near here]

After creating communities in terms of *Modularity*, we apply two different manipulations for node size and color, and we filter each. In the first step, we change the node-sizes from small to large and their color in relation to the *Betweenness Centrality* (indicating how often a node appears on the shortest paths between nodes in the network). In addition, we apply a filter that only shows nodes that correspond to a degree greater than two. Second, we set the colors in relation to the *Authority Measurement*, with shades of blue indicating significance and the sizes corresponding to the *Eigenvector Centrality* of each node. In the final step, we let the node sizes stay at the *Eigenvector Centrality* and change the colors to show the communities (*Randomized Modularity*) that remain larger than two after the degree filter.

¹ We use .pdf-files of the sample literature, extract references and create JSON-files, which we then convert into Gephireadable-formats, using a Python code provided by Markus Vogl, {Business & Data Science}.

3. Results

3.1 Descriptive Analysis

Figure 2 shows the number of relevant publications in the field of organizational resilience, management control systems and levers of control that we found in our literature research. It can be seen that the number of publications in the field of organizational resilience increased significantly beginning in 2008. This is in line with the findings of Annarelli and Nonio (2016) as well as Giacotti and Mauro (2020). Table 3 shows the distribution of the publications found among the various journals.

[Figure 2 near here]

[Table 3 near here]

3.2 Citation Network Analysis

With our citation network analysis, we find 6.826 publications. As shown in Table 2, regarding the *HITS-metrics*, we agree that not many research papers provide hyperlinks and are not dominant within the visible surface web, as the value tends to be zero². Regarding the *Eigenvector Centrality* (representing the influence of a node within the network), we find a negligible influence between the respective research papers. We state a *Diameter* of five as well as an *Average Path Length* of 2.017, which, according to Newman (2018), suggests that the nodes in the network tend to be closer together. The *Modularity* (representing the weights of the edges) is strong, with a value of 0.788 (Blondel et al., 2008). Table 4 shows relevant publications, the number of times cited, and their measure values.

[Table 4 near here]

In terms of *Modularity*, we identify 41 communities. Figure 3 pictures the six communities with the highest score.

[Figure 3 near here]

Table 5 shows the representative publications (the larger nodes of each community (see Figure 3)) from each of the six communities, the number of times the publications were cited, the number of publications in each community, and the percentage of the total citation network.

[Table 5 near here]

With 2.464 of 6.826 publications (nodes), the six communities with the highest score have a percentage share of 36.10% in the entire citation network.

² Each parameter starts with the value of one and will be normalized into [0, 1], which can be interpreted as probabilities.

Based on Abernethy and Brownell (1999) as the representative publication (cited 1.066 times), we name the community with the highest score (community I, comprising 10.64% of all publications) the *Accounting* community and label the nodes orange. Based on representative publications in the field of MCS, such as Abernethy and Brownell (1997), which are cited 646 times, and Abernethy and Chua (1996), which are cited 785 times, we term the community with the second highest score (community II, comprising 6.83% of all publications) the *Management Control Systems* community and label the nodes purple. Since the MCS literature emerged from the field of accounting (Strauß & Zecher, 2013), it would also be conceivable to combine community I and II into one large community.

The pink nodes (community III, comprising 5.29% of all publications) represent papers that contribute to the field of *Innovation*. The publications marked in yellow (community IV, comprising 5.19% of all publications) originate from *Resilience*. The nodes labelled in green (community V, comprising 4.25% of all publications) focus on *Sustainability*, and the nodes highlighted in blue (community VI, comprising 4.18% of all publications) belong to the content of *Organizational Development & Vulnerability*.

The six communities with the highest score identified with the citation network analysis reflect the results of the literature search described in Chapter 2. In accordance with the citation network, the publications found in the literature search offer a comprehensive overview of the various literature fields, such as accounting, management control systems, and resilience, relevant to this research work. It is noteworthy that Simons (1995) levers of control book, although cited 4.908 times, plays a subordinate role in the citation network. This could be explained by the fact that researchers read the book but mostly cite the sources on which the book is based.

3.3 Resilience at the Organizational Level – A Summary

Although, as Figure 2 shows, resilience is a relatively new concept in the organizational literature, it has been studied in a number of other areas such as disaster risk and emergency management, supply chains, psychology, and socioeconomic systems (Clément & Rivera, 2016). Organizational resilience is influenced by different research areas, e.g. resilient individuals, resilient engineering, infrastructure resilience, cyber resilience, system resilience, supply chain resilience and business resilience. Organizational resilience in turn itself influences different research areas, e.g., community resilience, societal resilience, economic resilience, city/urban resilience, territory resilience and socio-ecological resilience (Ruiz-Martin et al., 2018). Based on a systematic review of 339 influential publications Linnenluecke (2017) shows that resilience research in business and management has developed into five streams. These streams view resilience as ‘organizational responses to external threats’, ‘organizational reliability’, ‘employee strengths’, ‘the adaptability of business models’, and ‘the design principles that reduce supply chain vulnerabilities and disruptions’ (Linnenluecke, 2017, p.5).

Many studies have described organizational resilience as defensive response (resistance and/or recovery), but a change of perspective is currently taking place in which it is viewed as a rather ‘offensive’ response (adaptation) or by including the term ‘anticipation’ (Duchek, 2020).

Organizational Resilience Definitions

Annarelli and Nonino (2016) show that academic literature is still far from a shared consensus on developing organizational resilience and they identify supply chain resilience as the main field of research about organizational resilience since 2004. This finding is in line with Giacotti and Mauro (2020), who find that most studies in the field of organizational resilience focus on strategies that could help improve supply chain resilience. Organizational

resilience ‘is attracting greater levels of research interest as confirmed by the growing trend of the number of articles in the last seven years,’ and the ‘research topic is far from its infancy, but can be still considered in a developing phase’. Some research subfields are ‘not yet clearly defined or consolidated’ (Annarelli & Nonino, 2016, pp.4, 10). On the one hand, the term resilience is used synonymously in different research streams, but without a specific definition for each field (Conz & Magnani, 2020). On the other hand, different streams of research have developed their own definitions, theories and understanding of resilience (Linnenluecke, 2017).

Similar to Bisbe et al. (2007), we use thematic analysis and code development techniques based on Boyatzis (1998) to systematically identify patterns that organize the available information in a meaningful way, in a three step process. First, we sort relevant quotations of definitions³ as well as conceptualizations of organizational resilience in publications in ascending order by the time of publication. Our main focus has been on organizational resilience reviews, but we also select other types of publications in the organizational resilience literature since 2008. We chose this time frame due to the GFC in 2008 and the associated increased interest in resilience at the organizational level. In the second step, we identify the characteristic terms or meanings in the definitions of organizational resilience and sort these terms according to their frequency. In addition, we classify the terms by a proactive, concurrent and reactive time frame, similar to Duchek’s (2020) conceptual organizational resilience framework. In the final step, we develop our own working definition of organizational resilience based on the classified terms. The results of the manual and systematic literature searches in relation to the organizational resilience reviews as well as

³ For a systematic and detailed review of definitions of organizational resilience published between 2000 and 2017, see Conz and Magnani (2020).

relevant definitions for resilience at the organizational level in other types of publications, are shown in Appendix 1.

Lee et al. (2013) define resilience as a ‘multidimensional, socio-technical phenomenon that addresses how people, as individuals or groups, manage uncertainty’ (Lee et al., 2013, p.29).

At the organizational level, Seville (2008) defines resilience as the ability of an organization to not only survive but to thrive in the face of adversity. In relation to this definition, Vargo and Seville (2011) define surviving as the crisis management aspect, while thriving is the strategic planning aspect, and the aim is to find the ‘silver lining’ between the two. As part of a literature review of resilience in its widest context, Bhamra et al. (2011) define

organizational resilience as ‘the individual and organizational responses to turbulences and discontinuities’ (Bhamra et al, 2011, p.5385). Annarelli and Nonino (2016) claim to be the first authors to provide a literature review in the specific research areas of organizational resilience and its operational management. Based on a systematic literature search of 194 articles, Annarelli and Nonino (2016) propose the following definition for organizational resilience: ‘Organizational resilience is the organization’s capability to face disruptions and unexpected events in advance thanks to the strategic awareness and a linked operational management of internal and external shocks’ (Annarelli & Nonino, 2016 p.3). The authors state that organizational resilience has both static and dynamic attributes (Annarelli & Nonino, 2016).

Based on a systematic literature review of 191 articles, Ruiz-Martin et al. (2018) find that there are three different ways to define organizational resilience, albeit with common themes:

Resilience as a feature of an organization (i.e., something that an organization has), resilience as an outcome of the organization's activities (i.e., something that an organization does) as well as resilience as a measure of the disturbances that an organization can tolerate. (Ruiz-Martin et al., 2018, p.15)

Organizational resilience is seen as a property, ability or capability that can be improved over time (Ruiz-Martin et al., 2018). Duchek (2020) defines organizational resilience as ‘an organization’s ability to anticipate potential threats, to cope effectively with adverse events, and to adapt to changing conditions’ (Duchek, 2020 p.6). Based on a systematic literature review of 66 selected papers published between 2000 and 2017, Conz and Magnani (2020) develop a working definition for resilience at the firm level by emphasizing the temporal dimensions of resilience as a dynamic process in time:

Resilience is a dynamic attribute of the firm characterised by a) a proactive phase at time (t-1); an absorptive phase at time t, and b) a reactive phase at time (t+1), where t is the time when an unexpected event occurs and alters the equilibrium of the firm. (Conz & Magnani, 2020, p.407)

They argue that those two main paths (absorptive and adaptive) explain organizational resilience.

Based on the definitions in Appendix 1, we propose the following working definition for resilience at the organizational level:

Organizational resilience is the organization's ability to anticipate strategic uncertainties and contingencies as well as to adapt to changing conditions in the environment in order to survive in the short term and thrive in the long term during an unexpected and potentially adverse event.

Organizational Resilience Conceptualizations

Although academic interest in organizational resilience, has grown steadily in recent years (see Figure 2) the conceptualization of this complex construct is still in its infancy and there is no consensus about what resilience means and what elements it contains and there is no consistent and uniform understanding of the construct (Duchek, 2020). Duchek argues that ‘previous studies on resilience capabilities are extremely heterogeneous: They refer to different contexts, focus on specific problems, and use different research methods’ (Duchek, 2020, p.8). Ruiz-Martin et al. (2018) find that a clear conceptualization of the term

'organizational resilience' is lacking, and that there is a great variety regarding the factors and mechanisms that contribute to resilience. Although there are several reviews regarding resilience at the organizational level, the fundamental research questions 'How is organizational resilience conceptualized?' and 'How is organizational resilience assessed?' have not yet been answered (Ruiz-Martin et al., 2018, p.12). Furthermore Ruiz-Martin et al. (2018) indicate that there is a lack of consensus how to *measure* organizational resilience. This is in line with the findings of Cheng et al. (2020) in the organizational sciences.

Different research streams have developed their own definitions, theories and understandings of resilience, since resilience has been conceptualized very differently across the studies (Linnenluecke, 2017; Serfilippi & Ramnath, 2018). Conceptual similarities and differences between these literature streams have not yet been explored, and no knowledge of possible generalizable principles for the development of resilience has been gained (Linnenluecke, 2017). Resilience is operationalized very differently by researchers, with little insight into the empirical methods for recognizing an organization's resilience (or lack thereof) to future adversity (Linnenluecke, 2017; Tasic et al, 2020). Conz and Magnani (2020) confirm that the conceptualization of resilience at the organizational level within the management disciplines (disaster management, organizational studies, strategy and entrepreneurship) is still fragmented. With their scoping review of 57 conceptual organizational resilience frameworks, Giacotti and Mauro (2020) offer initial approaches to provide a comprehensive overview of conceptual frameworks relating to the development and improvement of organizational resilience.

Ruiz-Martin et al. (2018) propose the following conceptualization for organizational resilience: 'Resilience, at the organizational level, is the measurable combination of characteristics, abilities, capacities or capabilities that allows an organization to withstand known and unknown disturbances and still survive' (Ruiz-Martin et al., 2018, p.21). Duchek

(2020) develops a conceptual framework that combines a processual approach as well as a focus on resilience capabilities, and contains three successive resilience stages, the *anticipation (proactive) stage*, the *coping (concurrent) stage* and the *adaptation (reactive) stage*. The author specifies the following behaviors as central to each stage: *observation and identification* and *preparation* for the anticipation stage, *accepting* and *developing and implementing solutions* for the coping stage, and *reflection and learning* and *organizational change* for the adaptation stage (Duchek, 2020). Duchek (2020) further states that her framework can be seen as a first step towards the creation of a *resilience theory*. Figure 4 pictures Duchek's (2020) conceptual organizational resilience framework.

[Figure 4 near here]

3.4 Simons' Levers of Control – A Summary

The field of MCS research is fragmented in terms of definitions and conceptualizations, control systems design and use, and theoretical perspectives (Berry et al., 2009; Martyn et al., 2016; Merchant & Otley, 2006). There are various understandings and definitions of MCS in the academic literature. 'The term *MCS* seems to be used differently in different communities since in the US accounting academicians tend to use the term *managerial* (or management) *accounting* to include what most accounting academicians in Europe call *management control*' (Strauß & Zecher, 2013, p.242). In contrast to traditional *command and control* MCS perspectives, Simons' levers of control (LOC) represent an *innovation and control* MCS perspective (Simons, 1995b). Simons' innovation and control perspective is an established perspective on management control systems that is still used in MCS research (Journeault et al., 2016). According to Guenther et al. (2016), Simons' LOC framework is the most frequently used framework in the empirical research on MCS besides the Object of Control (OOC) framework of Merchant and van der Stede (2011). With a survey of 74 accounting researchers as well as syllabi search, Strauß and Zecher (2013) analyze Simons (2000) as one of the top three textbooks behind Anthony and Govindarjan (2007) and Merchant and van der Stede (2003). Strauß and Zecher (2013) indicate that their paper contributes to the literature on management control by providing an overview of analytical conceptualizations of MCS. With their literature review of the use of Simon's levers of control framework over the past 25 years in top academic journals in accounting, general management and strategic management, Martyn et al. (2016) identify 31 qualitative (case studies) and 14 quantitative (surveys) empirical studies. The LOC framework is used to a greater extent in qualitative studies, which have extended the application of the framework to contemporary issues such as changed organizational structures (for example sustainability), environmental accounting or inter-

organizational controls, as well as to new research topics such as corporate social responsibility (CSR) (Martyn et al., 2016).

Simons' LOC framework represents a strategic management tool and a theoretical framework for understanding relationships between strategy and control, in other words, a framework for both understanding how MCS manage business strategy, as well as for supporting the implementation of existing strategy and strategic renewal (Martyn et al., 2016). Simons defines management control systems as 'the formal, information-based routines and procedures used by managers to maintain or alter patterns in organizational activities' (Simons, 1994, p.170). A characteristic feature of the LOC is that Simons accepts and emphasizes the interconnectedness of the four MCS types and a firm must establish and balance all four types to control the organization successfully and to provide an effective control environment (Kruis et al., 2015; Nilsson, 2010; Simons, 2000). These four MCS types are called beliefs systems, boundary systems, diagnostic control systems, and interactive control systems (Simons, 1994, 1995b). Figure 5 pictures Simons' levers of control framework (Simons, 1995b).

[Figure 5 near here]

Beliefs systems are formal systems that senior managers use to systematically define, communicate and reinforce the purpose and direction of the organization's core values. Beliefs systems are communicated through formal documents such as credos, mission and vision statements, and statements of purpose, and provide organizational purpose and momentum to guide and motivate individual opportunity seeking within an unlimited space of opportunity (Simons, 1994, 1995b).

In dynamic environments, a system of restraints called boundary systems must be imposed on employees to prevent them from engaging in risky behaviors that conflict with the beliefs system (Widener, 2007). Top managers use boundary systems to set explicit rules and

limits, communicate the acceptable domain for opportunity seeking, and analyze the risks to be avoided. Boundary systems are formal systems that are usually given negatively or as minimum standards and are created through codes of business conduct, strategic planning systems, and operating directives for business managers (Simons, 1994, 1995b).

Simons defines a strategic risk as ‘an unexpected event or set of conditions that significantly reduces the ability of managers to implement their intended business strategy’ (Simons, 2000, p.255).

Diagnostic control systems are formal feedback systems (single-loop learning) that top managers use to monitor organizational outcomes and correct deviations from pre-set performance standards. Diagnostic control systems, as exemplified by business plans and budgets, are used to track variances from critical performance variables and enables managers to manage results on an exception basis (Simons, 1994, 1995b). The diagnostic system acts similarly to the boundary system and restricts the behavior of employees (Widener, 2007).

Interactive control systems are formal information systems used by senior managers to regularly and personally involve themselves in the decision activities of subordinates (Simons, 1994, 1995b). However interactive control systems are not used exclusively by higher level managers (Tuomela, 2005). Top managers can use many types of control systems interactively (Simons, 1994, 1995b; Tuomela, 2005), but under normal circumstances only one system at a time can serve as an interactive control system (Tuomela, 2005). The purpose of making a control system interactive is to draw attention to strategic uncertainties by imposing a dialogue (double-loop learning) as well as single-loop learning throughout the organization (Simons, 1994, 1995b), and to help the organization ‘search for new ways to strategically position itself in a dynamic marketplace’ (Widener, 2007, p.760).

Simons defines strategic uncertainties as the ‘emerging threats and opportunities’ (Simons, 2000, p.215) that ‘derive from senior management's perception of the known and

unknown contingencies that could threaten or invalidate the assumptions underlying the current strategy' (Simons, 1995b p. 94) as well as the 'uncertainties that top managers believe they must monitor personally to ensure that the goals of the firm are achieved' (Simons, 1990, p. 634). Simons also defines strategic uncertainties as 'a joint function of senior management's vision for the future and their assessment of the contingencies that could undermine that vision' (Simons, 1995 book p.169). 'Strategic uncertainties relate to changes in competitive dynamics and internal competencies that must be understood if the business is to successfully adapt over time' (Bisbe et al., 2007, p.797-798).

Simons (1994) summarizes his levers of control as follows: 'In situations of strategic change, control systems are used by top managers to formalize beliefs, set boundaries on acceptable strategic behavior, define and measure critical performance variables [diagnostic], and motivate debate and discussion about strategic uncertainties [interactive]' (Simons, 1994, p.169). The four levers create tension, since two of the levers generating positive energy (beliefs systems and interactive control systems) while the other two levers (boundary systems and diagnostic control systems) generate negative energy (Simons, 1995b). Since a core idea of this strategic control framework is to balance the need for innovation and constraints (Tuomela, 2005), Simons calls this interaction 'yin and yang' (Simons, 1995b, p.57). Although Simons positions management control and MCS as *tools* for implementing strategies developed by the organizations' top management, his MCS framework enables a *variation in human behavior* that, when approved by top management, can lead to new strategies (Strauß & Zecher, 2013). Simons' LOC framework is used to answer different research questions in different contexts but a number of gaps in the literature remain (Martyn et al., 2016).

3.5 Integrating Organizational Resilience into MCS and Vice Versa

In order to integrate organizational resilience into MCS we are looking for possible approaches or indications for organizational resilience in the MCS literature. Conversely, we examine the literature on organizational resilience for approaches to or hints about MCS.

3.5.1 Approaches in Simons' Levers of Control Publications

Addressing organizational resilience with MCS may provide a broader understanding of the relationship between the organization and adversity. The question is whether there are potential approaches for integrating organizational resilience into management control systems in Simons' levers of control publications or in the levers of control literature in other context. In order to search for potential approaches or hints for organizational resilience, we first engage in an in-depth examination of Simons' studies (Simons, 1987, 1991, 1992, 1994, 1995a, 1995b). We find that Simons mentions potential approaches that might be related. As a result of our in-depth analysis, Appendix 2 shows citations in Simons' publications, which could be related to organizational resilience. Similar to Bisbe et al. (2007), we use thematic analyses and code development techniques based on Boyatzis (1998) to systematically identify patterns that organize the available information in a meaningful way in three steps.

First, we classify the quotations of potential approaches to organizational resilience in Simons' publications in ascending order, sorted by date of publication. Next, we summarize the quotations of potential approaches to organizational resilience in relation to the four levers of control (beliefs systems, boundary systems, diagnostic control systems, and interactive control systems). In the last step, we assign the quotations according to the three stages and the time reference in Duchek's (2020) conceptual organizational resilience framework.

Anticipation, coping and adaptation are essential attributes of organizational resilience (Duchek, 2020; Ruiz-Martin et al., 2018). As mentioned in Chapter 3.3 Resilience at the

Organizational Level – A Summary, Duchek (2020) defines organizational resilience as ‘an organization’s ability to anticipate potential threats, to cope effectively with adverse events, and to adapt to changing conditions’ (Duchek, 2020, p.6). According to this definition, Duchek (2020) develops a conceptual framework that combines a processual approach as well as a focus on resilience capabilities, and contains three successive resilience stages, the *anticipation (proactive) stage*, the *coping (concurrent) stage* and the *adaptation (reactive) stage*. The author specifies the capabilities of *observation and identification* and *preparation* for the anticipation stage; *accepting* and *developing and implementing solutions* for the coping stage; and *reflection and learning* and *organizational change* for the adaptation stage (Duchek, 2020). Similarly, Ruiz-Martin et al. (2018) propose *building situation awareness*, the *ability to anticipate* and *learning capacity* as the attributes, elements or characteristics needed for a resilient organization (Ruiz-Martin et al., 2018).

Management Control Systems and Duchek’s (2020) Anticipation Stage

Interactive Control Systems. There are several observations regarding interactive control systems in Simons’ studies that could be related to Duchek’s (2020) anticipation stage and a proactive time reference.

Simons argues that ‘interactive control systems enable top-level managers to focus on strategic uncertainties to learn about threats and opportunities as competitive conditions change and to respond proactively’ (Simons, 1995a, p.81). Interactive management control processes can be used to direct organizational attention to emerging threats and opportunities. Due to the ‘energizing of the organization’ through the interactive management control processes, an impulse is created ‘to anticipate strategic uncertainties’ (Simons, 1990, p.641). Top managers can thus focus their attention on strategic uncertainties that could affect their future vision and use selected systems interactively to draw the attention of the entire

organization to these uncertainties (Simons, 1991). Participants can be warned by obvious changes in the data of the interactive control systems of the need to anticipate patterns of potential change in the future (Simons, 1995b). It could be speculated that, unlike defenders, prospectors (firms that compete through new products and market development) are using their MCS more intensively and actively to monitor uncertain and changing environments (Simons, 1990). Simons (1994) argues that ‘Managers participated actively in face-to-face meetings with subordinates to discuss both new data generated by the interactive control system and resulting action plans to preempt emerging threats and opportunities’ (Simons, 1994 p.180). The term *preempt* as used by Simons is related to Duchek’s (2020) proactive anticipation stage. In accordance with Duchek’s (2020) proactive time reference (before the unexpected event), Simons defines the time frame for interactive control systems as ‘present and future’ (Simons 1995b p.124). It is similarly possible to relate Simons’ term ‘present’ to Duchek’s (2020) coping (concurrent) stage.

Boundary Systems. In Simons’ studies, we are only able to find one approach in which boundary control systems could be linked to Duchek’s (2020) anticipation stage and proactive time reference. Simons argues that ‘implementing a strategy successfully requires the anticipation and proactive control of the risks [to be avoided] associated with that strategy’ (Simons, 1995b, p.168).

Management Control Systems and Duchek’s (2020) Adaptation Stage

There are several quotations in Simons’ studies that could be related to Duchek’s (2020) adaptation stage and a reactive time reference, without referring to any particular management control system. There are initial approaches in the literature that organizations facing high uncertainty will make extensive use of their control systems (Simons, 1987) and

‘management control systems play a critical role in creating competitive pressures within the organization to innovate and adapt’ (Simons 1995b, p.92). Simons (1987) refers to Hambrick (1983), who finds, that prospectors outperform defenders in industries that are innovative and dynamic because of their superior adaptability in those industries. Furthermore, Simons shows that industry dynamism is positively related to the return on invest (ROI) for prospectors and negatively associated with ROI for defenders, indicating that firms (organizations) are matching their business strategy well to their industry environment (Simons, 1987). The term matching can also be associated in a reactive way and linked to Duchek’s (2020) reactive adaptation stage. Simons indicates that the strategic focus for top managers of businesses facing crises is survival and the strategic uncertainty is how to change (Simons, 1990). In this context Simons argues that the allocation of attention is a particularly severe constraint for new top managers seeking strategic turnaround as everyone tries to learn the business, manage problems and crises, develop new agendas and provide resources for the implementation of new strategies (Simons, 1994).

Beliefs Systems. There are also quotes in Simons’ studies that could relate to the adaptation stage and a reactive time reference by Duchek (2020), referring to the four levers of control (beliefs systems, boundary systems, diagnostic control systems, and interactive control systems). We were only able to find one quote in Simons’ publication with direct reference to beliefs systems. Studying the Johnson & Johnson Tylenol crisis, Simons argues that the strong beliefs system embedded in its credo provided guidance for the types of solutions to be sought when problems arise (Simons, 1995a).

Boundary Controls. In the context of boundary controls, Simons notes that codes of business conduct, introduced after a major crisis, affected the integrity of the business (Simons, 1995a) and ‘most business conduct boundaries, then are developed and communicated after an

incident or crisis exposes the firm to unexpected asset or reputation losses' (Simons, 1995b, p.44). Just as business conduct boundaries are usually set after an incident or crisis, or when a crisis reveals the costs of wrongful employee actions, strategic boundaries are usually set when excessive experimentation can exhaust the firm's resources. In addition, learning about an incident or crisis in another firm is a vicarious way of assessing the usefulness of boundary systems (Simons, 1995b). In accordance with Duchek's (2020) reactive time reference (after the unexpected event), Simons defines the time frame for diagnostic control systems as 'past and present' (Simons 1995b, p.124). As mentioned above, it would also be conceivable to relate the term 'present' to Duchek's (2020) coping (concurrent) stage.

Interactive Control Systems .With regard to interactive control systems and the reactive adaptation stage (Duchek, 2020), Simons concludes that 'firms operating in uncertain environments employ control processes which are highly interactive and require the ongoing attention of operating managers' (Simons, 1987, p.370). According to Simons, interactive control systems are 'adaptive systems, which have structures that change to adapt to changing environment' (Simons, 1995b, p.105). Interactive control systems stimulate search and learning and enable new strategies to be developed when participants across the organization react to perceived opportunities and threats (Simons, 1995b). Simons indicates that in a crisis (new) top managers use multiple control systems interactively to change and survive (Simons, 1991, 1994, 1995b), and 'managers of firms in crisis typically use all control systems interactively for the short period necessary to figure out how to change and survive' (Simons, 1995b p.117). Systems that were previously interactive might no longer be utilized in that manner, and instead be used diagnostically. Other management control systems that were previously used diagnostically might be redesigned to work interactively, in order to create a sense of urgency in the organization. However, as soon as the crisis subsides, top managers move away from actively participating in multiple interactive control processes (Simons,

1991). Simons shows that top management's view of strategic uncertainties can change as the business matures, opens new markets, or reacts to changes in its environment (Simons, 1991), and that 'effective managers scan for disruptive changes [environmental changes] that signal the need to reconfigure organization structures, capabilities, and product technologies' (Simons, 1995b, p.91). However, the main question related to strategic uncertainties is how to survive (Simons, 1995b).

We are only able to find one quotation in Simons' publications that could relate to the adaptation stage and reactive time reference by Duchek (2020), referring to all four levers of control. In his levers of control book (Simons, 1995b), Simons refers to the four management control systems (beliefs systems, boundary systems, diagnostic control systems, and interactive control systems) and argues that 'these systems provide the motivation, measurement, learning, and control that allow efficient goal achievement, creative adaptation, and profitable growth' (Simons, 1995b, p.156).

In Table 6, we summarize the number of citations that we found in Simons' publications (Simons, 1987, 1991, 1992, 1994, 1995a, 1995b) that related to Duchek's (2020) organizational resilience stages, using a 5×3 matrix.

[Table 6 near here]

In Simons' studies it is obvious that interactive control systems offer the highest number of approaches for integrating organizational resilience into MCS.

3.5.2 Approaches in the LOC and MCS Literature

Since Simons' LOC framework is still used in the MCS literature, our main focus is also on the search for approaches to organizational resilience in the LOC and MCS literature. In order to search for and classify potential approaches or hints for organizational resilience in the LOC and MCS literature, we follow the methods explained in Chapter 3.5.1 Approaches in Simons' Levers of Control Publications. We find that there are potential approaches that might provide links between MCS and organizational resilience. Appendix 3 shows citations in the selected publications that could be related to organizational resilience.

Management Control Systems and Duchek's (2020) Anticipation Stage

We can find only one quotation in the LOC literature that could be related to Duchek's (2020) anticipation stage and a proactive time reference. With her empirical analysis of the levers of control framework, Widener (2007) finds that strategic risk (operational risk) and strategic uncertainty (competitive and operational uncertainty) determine the importance of diagnostic or interactive MCS. Widener (2007) states, that 'similar to strategic uncertainty, strategic risk requires increased information processing to assess the likelihood of risk and the magnitude of any resultant harm' (Widener, 2007, p.763). Under certain strategic conditions, the information processing requirements appear to be such that firms apply performance measures both interactively and diagnostically (Widener, 2007).

Management Control Systems and Duchek's (2020) Coping Stage

Interactive Control Systems. We can find several quotations that could be linked to Duchek's (2020) coping stage and a concurrent time reference. Using the example of Accounting Information Systems (AIS), Ezzamel and Bourn (1990) provide evidence of the interactive

use of MCS in an organization facing an external crisis. The authors state that ‘the AIS was observed to operate initially [in the pre-crisis phase] as a dialogue machine, and thereafter [during the crisis] as an idea machine’ (Ezzamel & Bourn, 1990, p.416). They divide a crisis into three stages: pre-crisis management, real time-crisis management, and post-crisis management (Ezzamel & Bourn, 1990). With their case study of top-performing organizations in the U.S. and Europe, Euske et al. (1993) show that in the face of a crisis, organizations gave up both their formal and informal control mechanisms in order to exercise specific, high intensity forms of control over the ‘errant’ individual or group. They find that performance measurement systems (diagnostic control systems) reflect the strategic objectives of a firm under stable operating conditions, and the use or reliance on formal measurement systems appeared to vary depending on the type of environmental conditions the organization is exposed to (Euske et al., 1993).

Tuomela (2005) states that ‘in uncertain environments financial [performance] measures are well suited for interactive use to stimulate discussion about different strategic uncertainties and how to deal with them’ (Tuomela, 2005, p.300). Using the LOC framework to examine responses to an external bank crisis, Janke et al. (2014) investigate the perception of negative external crisis effects upon the interactive use of MCS and vice versa. The authors indicate that the perception of negative external effects leads to more interactive use of MCS and the findings support a positive effect of the interactive use of MCS on senior managers' perception of negative external crisis effects. Janke et al. (2014) state that

the use of interactive MCS represents a way to cope with the increased demand for information processing during an externally induced economic crisis. In other words, the stronger an organization’s senior managers perceive negative external crisis effects to be, the more interactively the MCS are used. (Janke et al., 2014, p.253)

The qualitative evidence of the measures of Janke et al. (2014) suggests that cash flow information, forecasts and budgeting were used more interactively during an economic crisis.

It is noteworthy that in line with the literature the results of Janke et al. (2014) hint at a time lag between an intensified interactive use of MCS and the perception of negative external crisis effects. Janke et al. (2014) call for future qualitative studies to advance management accounting research by helping to understand exactly which MCS become more important in times of economic crises. Furthermore, the authors complain that existing management accounting research provides but little theoretical guidance regarding the question of how long it takes until changes in the environment lead to changes in accounting practices, and call for the development of further theoretical arguments regarding time-lagged effects, for instance the exact timing of cause-and-effect relationships between the investigated variables and possible mediating variables (Janke et al., 2014).

Martyn et al. (2016) call for investigation of the use of management control systems in an interactive manner during crisis periods, as well as the examination of the implications for managers of the increased use of interactive control systems. They state that ‘an examination of the implications for managers of the increased use of ICS [following an external crisis] is a promising area for future research’ (Martyn et al., 2016, p.293).

Management Control Systems and Duchek’s (2020) Adaptation Stage

We can find several quotations in the LOC and MCS literature that could be related to Duchek’s (2020) adaptation stage and a reactive time reference, although without referring to any particular management control system. In the early work of Otley and Berry (1980), the authors state, that

a full description of organisational control procedures must therefore include an analysis of those procedures which act to maintain viability through goal achievement, those concerned with the co-ordination and integration of differentiated parts, and those which promote adaptation to both internal and external change. (Otley & Berry, 1980, p.232)

In their review of the literature on control and accountability, Merchant and Otley (2006) summarize that ‘in broad terms, a management control system is designed to help an organization adapt to the environment in which it is set’ (Merchant & Otley, 2006, p.785).

We are able to find only one quotation in the LOC and MCS literature that could be related to the adaptation stage and a reactive time reference by Duchek (2020), which refers to interactive control systems. Gond et al. (2012) review the use of MCS for strategy-making and define interactive management control systems as ‘control systems that stimulate and guide emergent strategies in response to opportunities and/or threats within an organization’s operating environment’ (Gond et al., 2012, p.207). They describe the purpose of interactive control systems as drawing managers’ attention to strategic uncertainties and learning new strategic responses to a changing environment (Gond et al., 2012).

In Table 7, we summarize the number of citations that we found in the LOC and MCS literature relating to Duchek’s (2020) organizational resilience stages, using a 5 × 3 matrix.

[Table 7 near here]

In line with Simons’ levers of control publications, we find that in the LOC and MCS literature interactive control systems offer the highest number of approaches for integrating organizational resilience into MCS.

3.5.3 Approaches in the Organizational Resilience Literature

Although we focus on the search for approaches for organizational resilience in the MCS or LOC literature, based on the results found in Chapters 3.5.1 Approaches in Simons' Levers of Control Publications and 3.5.2 Approaches in the LOC and MCS Literature, it is just as conceivable that there are approaches for MCS and LCS in the organizational resilience literature. In order to search for and classify potential approaches or hints for MCS or LOC in the organizational resilience literature, we follow the methods explained in Chapter 3.5.1 Approaches in Simons' Levers of Control Publications. We find that there are approaches between organizational resilience and MCS or LOC that might be related. Appendix 4 shows citations in the selected publications that could be related to MCS or LOC.

Management Control Systems and Duchek's (2020) Organizational Resilience Stages

We find several quotations in the organizational resilience literature that could be related to all three stages of Duchek's (2020) organizational resilience framework, without referring to any particular management control system. In their work, Kantur and Iseri-Say (2012) present an integrative framework for organizational resilience and come to the conclusion that the relationship between organizational resilience and strategic management could be a further research question. They state that 'considering the proposed sources of organizational resilience such as strategic acting which incorporate factors of proactiveness and creativity, resilience is directly related to innovation, intrapreneurship or strategic entrepreneurship concepts which are central to discussions in strategic management research' (Kantur & Iseri-Say, 2012, p.772). Since the continuously changing environments require resilience in order for the organization to thrive and continue to function, and resilience is also associated with renewal, it can be expected that entrepreneurial activities and organizational resilience

strategies will be linked in order to achieve successful organizational outcomes (Kantur & Iseri-Say, 2012).

In their extended research agenda on organizational resilience to adversity in the natural environment, Clément and Rivera (2016) find that, from an organizational point of view, certain industries, especially those that directly depend on natural systems, are already at the forefront of addressing the resilience challenges arising from ecological adversity, and that organization and natural environment scholars are therefore perfectly positioned to address these issues and anticipate future research avenues and their potential implications for strategy and management (Clément & Rivera, 2016).

In their systematic review, Williams et al. (2017) do not discuss *control theory* as a key research topic in the crisis and resilience literatures, despite the possible connection. The authors anticipate that future research could examine how organizations design mechanisms of *control* that respond to disturbances, and that contributions to control theory can be made by examining how organizations recognize potential disruptions, prepare for those challenges, and overcome surprise in an effective way (Williams et al., 2017). Following van der Vegt et al. (2015), Williams et al. (2017) raise the question of whether it is possible to build resilient controls and if so, how can these be used to build resilient organizations, systems, and communities.

Beuren and d. Santos (2019) argue that ‘understanding the role of MCSs in the creation and use of resilience capacities offers a new way of explaining why some companies manage to outperform others during adverse and turbulent events’ (Beuren & d. Santos, 2019, p.308), and suggest ‘that the design and use of an MCS can contribute to the organization’s capacity for dealing with turbulences and unexpected events in advance’ (Beuren & d. Santos, 2019, p.319). The authors call for further studies to understand how MCSs contribute to the organizational resilience process when some rupture/unexpected event (for instance an

economic recession) occurs in an organization (Beuren & d. Santos, 2019). Other taxonomies of the MCS can be used to investigate the relationship between MCS and organizational resilience (Beuren et al., 2020) as well as to understand how the design and use of an MCS affect organizational resilience capacity (Beuren & d. Santos, 2019). Based on Mamouni Limnios (2014), Beuren et al. (2020) assume that MCS with more flexible characteristics encourage change and help individuals meet challenges and give them more capacity for organizational resilience. Based on Lengnick-Hall et al. (2011), Beuren et al. (2020) suppose that the combination of management practices at the organizational level (MCS) with influence at the individual level (empowerment) work together to support the resilience of organizations. The authors state that weakening the rules of information systems can lead to greater flexibility (at the expense of partial loss of control) and more efficient response to changes and stressful conditions, which can increase organizational resilience (Beuren et al., 2020). Beuren (2020) provide empirical evidence that the enabling perceptions of the MCS positively influence the capability of organizational resilience. In particular, they suggest that the enabling configurations of the MCS may favor the process of adaptation, modification, coping, and reinvention, because MCS are flexible systems (Beuren et al., 2020).

Beliefs Systems and Interactive Control Systems. We can find several quotations in the organizational resilience literature that could be related to all three stages of Duchek's (2020) organizational resilience framework and referring to particular management control systems. In the work of Akgün and Keskin (2014), as well as in the work of Seville et al. (2015), we find quotations related to beliefs systems and interactive control systems. Akgün and Keskin (2014) determine that management should improve the organizational resilience capacity to leverage the firm's product innovativeness and performance, and to cope with environmental turbulence. They state that

to this end, management can develop values that lead to routines of collaboration and traditions of flexibility, create open communication channels and interpersonal ties as well as informal and face-to-face dialogues, seek multiple sources of information, encourage unlearning of obsolete information or dysfunctional heuristics, and promote creativity. (Akgün & Keskin, 2014, p.6930)

Furthermore the authors propose that

management might also establish a clear sense of purpose and identity throughout the organisation, instill a mindset that questions fundamental assumptions and positive perceptions of experiences, foster a psychologically safe environment where people can take interpersonal risks, and impose individual and group accountability. (Akgün & Keskin, 2014 p.6930)

In their study, Seville et al. (2015) elaborate the principles of a resilient organization. They state that ‘every organization is made up of people’ and ‘face-to-face contact with those people will provide a much better diagnostic of the organization’s health than any KPI scorecard’ (Seville et al., 2015, p.9). They conclude that learning goes hand in hand with leadership and that a learning culture is one of the foundations of resilience. In particular, employees who believe that they are an essential part of the organization’s success accept their role as both contributors and change agents (Seville et al., 2015).

There are also quotations in the organizational resilience literature related to beliefs systems in Koronis and Ponis (2018). The authors propose a framework based on a review of the existing literature that integrates the four drivers of resilience under a common set of social capital and organizational values, such as trust, perceived organizational identity, and an error-friendly culture. The key notion of their framework is that resilience requires an open-minded and dedicated spirit, traits that require the existence of core values (Koronis & Ponis, 2018). The authors state that ‘management theory and business executives need to further explore their capacity to absorb and adapt in a changing environment full of strategic

challenges, emerging crises and sudden and unexpected accidents and disasters' (Koronis & Ponis, 2018, p.33).

Boundary Systems and Interactive Control Systems. In the work of Barasa et al. (2018) we find quotations that could be related to boundary systems and interactive control systems. The authors find that the resilience of organizations is influenced by preparedness and planning and governance processes, amongst others. They show that governance⁴ practices influence the resilience of organizations to acute and everyday challenges, in both the health care and other sectors. Barasa et al. (2018) identify a number of governance practices as critical for organizational resilience. One such practice is decentralization, which means that resilient organizations have implemented a form of governance characterized by distributed control rather than a top-down hierarchy under centralized control. Another governance practice that distinguishes resilient from non-resilient organizations is non-linear planning, which is evolving, open-ended, iterative, characterized by feedback loops between stages, and involves trial and error learning (Barasa et al., 2018).

Management Control Systems and Ducheck's (2020) Coping Stage

In the organizational resilience literature, we are only able to find one quote that could refer solely to the coping stage and a concurrent time reference in Ducheck's (2020) organizational resilience framework, without referring to a specific management control system. In their empirical study of the antecedents of organizational resilience in Swedish textile and clothing SMEs, Pal et al. (2014) find that the role of leadership and management decision-making were influential factors in facilitating resilience during crisis. They state that 'firms like those

⁴ Governance here means the rules and processes that guide the operations and affairs of the organization.

could break-away from the “command and control culture” generally prevalent in small family firms, and became more entrepreneurial and open, and showed better economic resilience’ (Pal et al., 2014, p.420).

In Table 8, we summarize the number of citations that we found in the organizational resilience literature relating to MCS or LOC using a 5×3 matrix.

[Table 8 near here]

In line with our findings in Simons’ levers of control publications and the LOC and MCS literature, we can find that interactive control systems in the organizational resilience literature offer the highest number of approaches for integrating organizational resilience into MCS. In addition, beliefs systems have been found to offer approaches for integrating organizational resilience into MCS. It is worth mentioning that most of the quotations found relate to all three stages of Duchek’s (2020) framework.

4. Discussion

In this study, we examine why and how to integrate organizational resilience into existing management control systems to enable managers to promote and improve organizational resilience. By integrating organizational resilience into the MCS, the resilience of the organization may be improved more effectively than with two separate management systems. Thus, integrating organizational resilience into MCS might be a decisive indicator of why some organizations are more resilient than others.

By analyzing the literature on MCS and organizational resilience, our results show that an integration of organizational resilience into MCS is beneficial for organizations.

In the first step, we link our working definition of resilience at the organizational level to Simons' LOC and the MCS literature. Simons emphasizes that a firm must establish and balance four types of MCS to successfully control the organization and to provide an effective control environment (Kruis et al., 2015; Nilsson, 2010; Simons, 2000). We show that interactive control systems are suitable for anticipational aspects of resilience systems. Interactive control systems provide assessment and the pre-empting of emerging threats and opportunities, which correspond to organizational resilience's proactive anticipation stage. This finding is in line with prior literature in which management control systems have been made interactive in the event of unexpected potentially adverse events such as a crisis (Euske et al., 1993; Ezzamel & Bourne, 1990; Janke et al., 2014; Simons, 1991; Simons, 1994, Simons, 1995b; Tuomela, 2005; Widener, 2007).

Furthermore, the reactive adaptation stage of organizational resilience could be integrated within interactive controls. We argue that without adaptation, for instance the adaptation of MCS or the adaptation through innovation, the organization's resilience becomes weaker. Thus, a highly innovative and adaptable organization could be more resilient than less

innovative and adaptable organizations. This is in line with the results of Hambrick (1993), who find that prospectors outperform defenders in industries which are innovative and dynamic because of their superior adaptability. In addition, Teixeira and Werther (2013) find that the innovation process and the way organizations manage it form the foundation of a resilient organization, and an organization that anticipatorily and repeatedly adapts can be called resilient.

Second, we find that the organizational resilience approaches in the literature on LOC and MCS and vice versa show possible connections between these two research areas. According to Mamouni Limmios et al. (2014), all previous approaches of organizational resilience, for instance complex systems survival, system adaptation, absorbance of disturbance, or the robustness or the ability to rebound and recover from adversity, have in common the characteristic that organizational resilience is always approached as a *positively* desirable concept or system attribute. With regard to Simons' 'yin and yang' interaction (Simons, 1995b, p.57) of two control levers generating positive energy and the remaining two levers generating negative energy (Simons, 1995b), we assume that there could be a link between organizational resilience and its beliefs systems or interactive control systems. This finding is in line with Akgün and Keskin (2014), Seville et al. (2015) and Koronis and Ponis (2018).

Barasa et al. (2018) find that governance practices (the rules and processes that guide the operations and affairs of the organization) influence the resilience of organizations, to both acute and everyday challenges, in the health care and other sectors, and identify a number of governance practices, for instance decentralization and non-linear planning, as critical for organizational resilience. Understanding governance in the sense of control (Ortiz-de-Mandojana & Bansal, 2016), we expect that MCS will have a positive effect on firms' organizational resilience. Furthermore, van der Meer-Kooistra and Scapens (2008) find that a

set of governance practices (control practices), underpinned by social, technical, institutional and economic structures, strengthen the relationship between and within organizations, while maintaining flexibility in managing a changing and uncertain context. We argue that these results support the argument that appropriate MCS can increase organizational resilience.

Another argument that appropriate MCS can increase organizational resilience is found in the study by Pal et al. (2014), who examine the antecedents of organizational resilience in Swedish textile and clothing SMEs. The authors find that firms that were able to break-away from the *command and control* culture showed better economic resilience. In contrast to the traditional command and control perspective, Simons (1995b) takes an *innovation and control* perspective with his levers of control framework. Based on these results, we argue that firms that adopt an innovation and control perspective may be able to strengthen their organizational resilience.

By integrating organizational resilience into management control theory, our results could be a further step towards a new *resilience theory* (Cheng et al., 2020; Clément & Rivera, 2016; Duchek, 2020; Quinlan et al., 2016). With regard to Simons' (1995b, p.94) definition of strategic uncertainties ('the uncertainties and contingencies that could threaten or invalidate the current strategy of the business' as well as our developed working definition for organizational resilience (*organizational resilience is the organization's ability to anticipate strategic uncertainties and contingencies...*), it might be possible to link the results found to contingency theory. According to Merchant and Otley (2006) 'contingency research was motivated by the generally correct belief that no single control or MCS is optimal in all situations and that the control choices depend on any of a number of situational (or "contingent") factors' (p.787). In this context, Koronis and Ponis (2018) consider organizational resilience to be a newer tradition in management theory, which contains insights from both coping and contingency theories. With their study of building

organizational resilience in the U.K. energy sector, Burnard et al. (2018) support these links between resilience and contingency theory with their findings that there is no one best configuration suited to every contextual situation.

5. Concluding Remarks

Managing challenges and turbulences in a changing business climate requires developing organizational capacities to survive, adapt, cope and sustain. The global COVID-19 pandemic has had a tremendous impact on organizations. In this context, the study of organizational resilience in order to survive and thrive is becoming increasingly important.

The purpose of this paper is to use Simons' levers of control framework (Simons, 1995b) to investigate the integration of organizational resilience into MCS as well as to find approaches for organizational resilience in the MCS literature, and vice versa approaches for the use of MCS in the organizational resilience literature.

We contribute to both management control and organizational resilience literature by providing a systematic review of analytical conceptualizations and definitions of MCS, Simons' LOC, and organizational resilience, supplemented by current empirical findings as well as a full citation network analysis. Based on definitions on organizational resilience found in the literature, we develop our own working definition for resilience at the organizational level.

Our results show that there are a few approaches in the MCS, LOC or organizational resilience literature for integrating organizational resilience into management control systems and linking these two research streams. Accordingly, this review is a step towards closing the gap between the management control (levers of control) and organizational resilience literature and achieving the ability to deal with and manage resilience at the organizational level. Additionally, this review could be a further step towards understanding why some firms are more resilient than others.

With this review we contribute to the calls for future research in the field of

organizational resilience and strategic management or management control by Clément and Rivera (2016), Kantur and Iseri-Say (2012), and Williams et al. (2017).

There are also limitations to be addressed. First, we use EBSCO and ScienceDirect databases for the literature search, define the field of business, management and accounting as the scope of our research, and exclude other research fields (e.g., logistics or supply chain). There might be insights these areas could provide which might be relevant for promoting and improving resilience by using MCS. Although we use snowball sampling, check the references of the articles found in order to find literature that did not show up in our search, and perform a full citation network analysis, we could not exclude the possibility that we missed relevant prior research. Further research might address this limitation and use additional databases and search terms for literature searches. A second limitation might be our focus on Simons' LOC. Future researchers have the opportunity to focus on additional MCS frameworks to integrate organizational resilience into MCS. Third, literature reviews only provide meta-analytical or theoretical insights.

Against this background, we see approaches for future research. Future researchers could use both quantitative and qualitative studies to examine the link between management control systems and organizational resilience. For instance, longitudinal studies in times of crises might offer insights that, according to van der Stede (2011), are not available in times of normal change. In particular, investigating interactive control systems during crisis periods could be a response to the call of Martyn et al. (2016) that 'the use of control systems in an interactive manner during crisis periods merits further attention' (p.292; see also Janke et al., 2014). Another option could be studies within the same or a different industry and context to provide further insights into bridging the gap between management control systems and organizational resilience literature. The interaction between controls (Widener, 2007), and the integration of sustainability and its impact on organizational resilience could also be fruitful

areas for future research. Last but not least we refer to Gond et al. (2012), who state that MCSs, when used appropriately, can drive organizations towards sustainability, and we argue that, when used appropriately, MCSs can drive organizations towards resilience.

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Declaration of Interest Statement

There is no conflict of interest.

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Appendix

Appendix 1. Categorizing Organizational Resilience Definitions according to Duchek (2020)

Year	Author	Definition for Resilience at the Organizational Level	Proactive (before the unexpected event)	Concurrent (during the unexpected event)	Reactive (after the unexpected event)
2008	McManus	'Resilience is a function of an organization's overall situation awareness, management of keystone vulnerabilities, and adaptive capacity in a complex, dynamic, and interconnected environment'.	situation awareness	managing	adapting
2008	Seville	Resilience is 'the organisation's ability to survive' [...] 'the ability of an organization to thrive, in both good times and in the face of adversity'		surviving	thriving

2011	Vargo and Seville	‘survive is the crisis management aspect, while thrive is the strategic planning aspect, finding the silver lining’		surviving	thriving
2011	Lengnick-Hall et al.	‘We propose that a firm's capacity for developing organizational resilience is achieved through strategically managing human resources to create individual competencies among core employees, that when aggregated at the organizational level, make it possible for organizations to effectively absorb uncertainty, develop situation-specific responses to threats, and ultimately engage in transformative activities so that they can capitalize on disruptive surprises that potentially threaten their survival’		managing	responding
				absorbing	
				surviving	

2011	Bhamra et al.	‘Resilience is related to both the individual and organizational responses to turbulences and discontinuities’		responding	
2011	Burnard and Bhamra	‘Resilience is the emergent property of organizational systems that relates to the inherent and adaptive qualities and capabilities that enable an organization’s adaptive capacity during turbulent periods. The mechanisms of organizational resilience thereby strive to improve an organisation’s situational awareness, reduce organizational vulnerabilities to systemic risk environments and restore the efficacy following the events of a disruption’	situation awareness	reducing adapting	restoring

2012	Kantur and Iseri-Say	<p>‘The ability to absorb the changes effectively to assure continuity and even turn them into opportunities is the resilience capacity of the organization’[...]</p> <p>‘Resilience should not be considered as an attribute or a dimension that organizations possess but instead it is the capability of organizations for turning adverse conditions into organizational opportunity’</p>	opportunity-seeking	<p>absorbing</p> <hr/> <p>continuing</p>	opportunity-seeking
2013	Teixeira and Werther	<p>‘[...], we argue that it is the innovation process and how companies manage it that forms the foundation of a resilient organization. Our research finds that organizational innovation processes take three main forms: reactive, proactive, and anticipatory innovators.’ [...]</p> <p>Against this</p>	anticipating	surviving	adapting

		turbulent environment, survival depends on adaptability with reactive responders falling behind proactive responders and both succumbing to anticipatory, serial innovators.’ [...] ‘Resilient organizations are anticipatory responders that are able to follow up with successive industry-changing innovations.’ [...]’However, unlike organisms, organizations can also adapt proactively or anticipatorily, reacting to future changes before they happen. An organization that adapts anticipatorily and repeatedly can be called resilient.’			
2014	BS 65000:2014	‘Organizational resilience is the ability of an organization to anticipate, prepare for,	anticipating	surviving	responding
			preparing		adapting

		and respond and adapt to incremental change and sudden disruptions in order to survive and prosper’			prospering
2015	Ortiz-de-Mandojana and Bansal	‘We apply the concept of organizational resilience, which we define as the incremental capacity of an organization to anticipate and adjust to the environment’	anticipating		adjusting
2016	Annarelli and Nonino	‘Organizational resilience is the organization’s capability to face disruptions and unexpected events in advance thanks to the strategic awareness and a linked operational management of internal and external shocks. The resilience is static, when founded on preparedness and preventive measures to minimize threats probability and to reduce any impact that	preparing preventing	managing	recovering

		may occur, and dynamic, when founded on the ability of managing disruptions and unexpected events to shorten unfavourable aftermaths and maximize the organization's speed of recovery to the original or to a new more desirable state'			
2017	Williams et al.	Resilience is 'the process by which an actor (i.e., individual, organization, or community) builds and uses its capability endowments to interact with the environment in a way that positively adjust and maintains functioning prior to, during, and following adversity'	adjusting	adjusting	adjusting
			maintaining	maintaining	maintaining

2018	Ruiz-Martin et al.	<p>‘Resilience as a feature of an organization (something that an organization has), resilience as an outcome of the organization's activities (something that an organization does) as well as resilience as a measure of the disturbances that an organization can tolerate’ [...] ‘Resilience, at the organizational level, is the measurable combination of characteristics, abilities, capacities or capabilities that allows an organization to withstand known and unknown disturbances and still survive. Like most core competencies, it must be home grown and nurtured through time’</p>		withstanding	
				surviving	

2018	Koronis and Ponis	Organizational resilience is ‘a term drawn from engineering and ecology to describe how fast a system under pressure returns to equilibrium following a perturbation. We therefore view resilience as the accumulated cultural capacity of an organization to make sense of risks and negative events, to absorb the pressure and ultimately protect the organization’s social capital and reputation’		absorbing	returning
				protecting	
2019	Duchek	‘We define organizational resilience as an organization’s ability to anticipate potential threats, to cope effectively with adverse events, and to adapt to changing conditions’	anticipating	coping	adapting
2020	Conz and Magnani	Resilience is a dynamic attribute of the firm characterised by a) a proactive phase at time (t-1); an absorptive phase at time t, and b) a	anticipating	absorbing	reacting

		reactive phase at time (t+1), where t is the time when an unexpected event occurs and alters the equilibrium of the firm'			
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Appendix 2. Citations in Simons' Publications, which could be related to Organizational Resilience according to Duchek (2020)

Source	Levers of Control	Organizational Resilience Stage	Time Reference	Main Findings potentially related to Organizational Resilience
1991	Interactive	Anticipation	Proactive	'The results (Simons, 1987) led to speculation that prospectors use their management control systems intensively to monitor uncertain and changing environments. Defenders, by contrast, use management control systems less actively'
1991	Interactive	Anticipation	Proactive	'Top managers focus their attention on strategic uncertainties that could derail their vision for the future and use selected systems interactively to focus the attention of the entire organization on these uncertainties'
1992	Interactive	Anticipation	Proactive	'The analysis shows that interactive management control processes can be used to manage emergent strategy: rather than focusing on what the organization already understands

				and does well, these systems direct organizational attention to emerging threats and opportunities’
1992	Interactive	Anticipation	Proactive	‘The organization is energized (by the interactive process): momentum is created to exploit existing strategies and to anticipate strategic uncertainties’
1994	Interactive	Anticipation	Proactive	‘Managers participated actively in face-to-face meetings with subordinates to discuss both new data generated by the interactive control system and resulting action plans to preempt emerging threats and opportunities’
1995a	Interactive	Anticipation	Proactive	‘Interactive control systems enable top-level managers to focus on strategic uncertainties to learn about threats and opportunities as competitive conditions change and to respond proactively’
1995b	Interactive	Anticipation	Proactive	‘Changes evident in the data (of interactive control systems) warn participants to anticipate patterns of potential change in the future’

1995b	Boundary	Anticipation	Proactive	‘Implementing a strategy successfully requires the anticipation and proactive control of the risks associated with that strategy (Risks to be avoided)’
1995b	Interactive	Anticipation	Proactive	‘The time frame of diagnostic control systems is past and present, the time frame of interactive control systems is present and future’
1995b	Diagnostic	Coping	Concurrent	‘The time frame of diagnostic control systems is past and present, the time frame of interactive control systems is present and future’
1995b	Interactive	Coping	Concurrent	‘The time frame of diagnostic control systems is past and present, the time frame of interactive control systems is present and future’
1987	Unspecified	Adaptation	Reactive	‘Tushman & Nadler (1978), following Ashby's (1956) notion of requisite variety, argue that organizations facing high uncertainty will utilize their control systems to a high degree’

1987	Unspecified	Adaptation	Reactive	‘Hambrick (1983), however, found that Prospectors outperform Defenders in industries which are innovative and dynamic; Hambrick argues that this is due to their superior adaptability in these industries’
1987	Unspecified	Adaptation	Reactive	‘Table 4 show that industry dynamism is positively related to ROI for Prospectors and negatively associated with ROI for Defenders. This result indicates that firms do well match their business strategy to their industry environment, a position advocated by Andrews (1971) and Porter (1980)’
1991	Unspecified	Adaptation	Reactive	‘Three of these businesses faced crises due to failed strategies and resultant losses. The strategic focus for top managers of these business was survival and the strategic uncertainty was: how do we change?’
1994	Unspecified	Adaptation	Reactive	‘Allocation of attention is an especially serious constraint for new top managers attempting strategic turnaround as each attempts to learn the business, deal with problems and crises,

				develop new agendas, and marshal resources to implement new strategies’
1995b	Unspecified	Adaptation	Reactive	‘Management control systems play a critical role in creating competitive pressures within the organization to innovate and adapt’
1995a	Beliefs	Adaptation	Reactive	‘When problems arise, such as when J&J (Johnson & Johnson) faced the Tylenol crisis, the strong beliefs system embedded in its credo provided guidance regarding the types of solutions to search for’
1995a	Boundary	Adaptation	Reactive	‘Each of those codes (codes of business conduct) was instituted after a major crisis impaired the integrity of the business’
1995b	Boundary	Adaptation	Reactive	‘Most business conduct boundaries, then are developed and communicated after an incident or crisis exposes the firm to unexpected asset or reputation losses’

1995b	Boundary	Adaptation	Reactive	‘Learning about an incident or crisis in another firm is a vicarious way of estimating the benefits of boundary systems’
1995b	Boundary	Adaptation	Reactive	‘Just as business conduct boundaries are usually imposed after an incident or crisis, strategic boundaries are usually imposed when excessive search behaviour and experimentation have risked dissipating the firm's resources’
1995b	Boundary	Adaptation	Reactive	‘Finally, business conduct boundaries are imposed any time that a crisis demonstrates the costs of errant employee actions’
1995b	Diagnostic	Adaptation	Reactive	‘The time frame of diagnostic control systems is past and present, the time frame of interactive control systems is present and future’
1987	Interactive	Adaptation	Reactive	‘Simons (in press) concludes that firms operating in uncertain environments employ control processes which are highly interactive and require the ongoing attention of operating managers’

1991	Interactive	Adaptation	Reactive	‘Crisis may develop. A new top manager may bring a new vision to the organization. With each of this changes, systems that were previously interactive may be de-emphasized and used diagnostically, and other systems made newly interactive’
1991	Interactive	Adaptation	Reactive	‘Top managers use multiple control systems interactively only during short periods of crisis’
1991	Interactive	Adaptation	Reactive	‘Existing MCS that had previously been used diagnostically were made interactive to create a sense of urgency in the organization’
1991	Interactive	Adaptation	Reactive	‘Once crisis began to subside, top managers removed themselves from active involvement in multiple interactive control processes’
1991	Interactive	Adaptation	Reactive	‘It was evident from the data gathered during this study that top management's assessment of strategic uncertainties may change as business mature, move into new markets, or react to changes in their environment’

1994	Interactive	Adaptation	Reactive	'The computer company was in crisis and the top management made multiple systems interactive'
1995b	Interactive	Adaptation	Reactive	'The manager of the computer company, which was in crisis, made multiple systems interactive'
1995b	Interactive	Adaptation	Reactive	'The manager of the computer company, which was in crisis, made multiple systems interactive'
1995b	Interactive	Adaptation	Reactive	The main question related to strategic uncertainties was 'how can we survive?'
1995b	Interactive	Adaptation	Reactive	'Effective managers scan for disruptive changes (environmental change) that signal the need to reconfigure organization structures, capabilities, and product technologies'
1995b	Interactive	Adaptation	Reactive	'These control systems (interactive) stimulate search and learning, allowing new strategies to emerge as participants throughout the organization respond to perceived opportunities and threats'

1995b	Interactive	Adaptation	Reactive	Interactive control systems are ‘adaptive systems, which have structures that change to adapt to changing environment’
1995b	Interactive	Adaptation	Reactive	‘In our framework interactive control systems guide the experimentation and learning that are necessary for new autonomous (autonomous initiatives have adaptive value for the organization) strategic initiatives to emerge and be tested in the organization’
1995b	Interactive	Adaptation	Reactive	Managers with an unclear vision use multiple interactive systems in ‘crisis’ to ‘change and survive’ (figure 5.5)
1995b	Interactive	Adaptation	Reactive	‘Managers of firms in crisis typically use all control systems interactively for the short period necessary to figure out how to change and survive’
1995b	All four levers	Adaptation	Reactive	‘These systems (four levers) provide the motivation, measurement, learning, and control that allow efficient goal achievement, creative adaption, and profitable growth’

Appendix 3. Citations in the LOC and MCS Literature, which could be related to Organizational Resilience according to Duchek (2020)

Author	Year	Levers of Control	Organizational Resilience Stage	Time Reference	Main Findings potentially related to Organizational Resilience
Widener	2007	Interactive/ Diagnostic	Anticipation	Proactive	‘Similar to strategic uncertainty, strategic risk requires increased information processing to assess the likelihood of risk and the magnitude of any resultant harm’
Ezzamel and Bourne	1990	Interactive	Coping	Concurrent	‘With high uncertainty on both dimensions, decision making becomes ‘inspirational’. This calls for the AIS to operate as an ‘idea machine’, providing multiple streams of thought, Delphi processes, and experience sharing in order to encourage creativity’ [...] ‘the AIS was observed to operate initially as a dialogue machine, and thereafter as an idea machine’
Euske et al.	1993	Interactive	Coping	Concurrent	‘Finally, the use of, or reliance upon, formal measurement systems appeared to vary depending on the type of environmental conditions faced by the organization. When faced with a crisis, organizations abandoned both their formal and informal control mechanisms to exert specific, high intensity

					forms of control over the 'errant' individual or group. The combined results suggest that performance measurement systems do reflect the strategic objectives of a firm under stable operating conditions.'
Tuomela	2005	Interactive	Coping	Concurrent	'In uncertain environments financial (performance) measures are well suited for interactive use to stimulate discussion about different strategic uncertainties and how to deal with them.'
Janke et al.	2014	Interactive	Coping	Concurrent	'This reasoning suggests that the use of interactive MCS represents a way to cope with the increased demand for information processing during an externally induced economic crisis. In other words, the stronger an organization's senior managers perceive negative external crisis effects to be, the more interactively the MCS are used' [...] 'The results show that perception of negative external crisis effects leads to more interactive use of MCS. Moreover, our findings support a positive effect of the interactive use of MCS on senior managers' perception of negative external crisis effects'
Martyn et al.	2016	Interactive	Coping	Concurrent	'the use of control systems in an interactive manner during crisis periods merits further attention'

Otley and Berry	1980	Unspecified	Adaptation	Reactive	‘A full description of organisational control procedures must therefore include an analysis of those procedures which act to maintain viability through goal achievement, those concerned with the co-ordination and integration of differentiated parts, and those which promote adaptation to both internal and external change’
Merchant and Otley	2007	Unspecified	Adaptation	Reactive	‘In broad terms, a management control system is designed to help an organization adapt to the environment in which it is set’
Gond et al.	2012	Interactive	Adaptation	Reactive	‘Interactive control systems stimulate and guide emergent strategies in response to opportunities and/or threats within an organization’s operating environment. The purpose of interactive control systems is to direct managers’ attention toward strategic uncertainties and to learning novel strategic responses to a changing environment’

Appendix 4. Citations in the Organizational Resilience Literature, which could be related to MCS or LOC according to Duchek (2020)

Author	Year	Levers of Control	Organizational Resilience Stage	Time Reference	Main Findings potentially related to Management Control Systems
Kantur and Iseri-Say	2012	Unspecified	Anticipation, coping, adaptation	Proactive, concurrent, reactive	<p>‘Another further research question would be establishing the relationship of organizational resilience to strategic management. Considering the proposed sources of organizational resilience such as strategic acting which incorporate factors of proactiveness and creativity, resilience is directly related to innovation, intrapreneurship or strategic entrepreneurship concepts which are central to discussions in strategic management research.</p> <p>Organizations facing continuously changing environments need to differentiate themselves from others through innovation and entrepreneurial initiatives. These same environments also require resilience in order for the organization to thrive and continue functioning. However, resilience is also related with renewal.</p>

					Considering these, entrepreneurial activities and resilience strategies can be expected to be interconnected so as to create successful organizational outcomes.'
Akgün and Keskin	2014	Beliefs, interactive	Anticipation, coping, adaptation	Proactive, concurrent, reactive	'Based on this study, management should improve firm resilience capacity to leverage the firm's product innovativeness and performance and to cope with environmental turbulence. To this end, management can develop values that lead to routines of collaboration and traditions of flexibility, create open communication channels and interpersonal ties as well as informal and face-to-face dialogues, seek multiple sources of information, encourage unlearning of obsolete information or dysfunctional heuristics, and promote creativity. Management might also establish a clear sense of purpose and identity throughout the organisation, instill a mindset that questions

					fundamental assumptions and positive perceptions of experiences, foster a psychologically safe environment where people can take interpersonal risks, and impose individual and group accountability.’
Seville et al.	2015	Beliefs, interactive	Anticipation, coping, adaptation	Proactive, concurrent, reactive	‘The way in which people throughout an organization—from the CEO to call center employees—demonstrate leadership influences resilience.’ [...] ‘Leadership needs to be provided to internal as well as external stakeholders of the organization. Every organization is made up of people. Face-to-face contact with those people will provide a much better diagnostic of the organization’s health than any KPI scorecard.’ [...] ‘Learning goes in tandem with leadership.’ [...] ‘a culture of learning is one of the underpinnings of resilience.’ [...] ‘Employees believe that they are an integral part of the enterprise’s success and accept their role as both contributors and change agents.’

Clément and Rivera	2017	Unspecified	Anticipation, coping, adaptation	Proactive, concurrent, reactive	‘From an organizational perspective, certain industries, especially those that directly depend on natural systems, appear to already be at the forefront of the resilience challenges posed by ecological adversity. Organization and natural environment scholars are therefore perfectly positioned to tackle and anticipate future research avenues in this area and their potential implications for strategy and management.’
Williams et al.	2017	Unspecified	Anticipation, coping, adaptation	Proactive, concurrent, reactive	‘despite the potential connection, our systematic review did not uncover ‘control theory’ as a substantial research theme in the crisis and resilience literatures’ [...] ‘We anticipate that future research might explore how organizations design mechanisms of ‘control’ that involve responding to disturbances’ [...] ‘Is it possible to build resilient controls and if so, how can these be used to build resilient organizations, systems, and communities’ [...] ‘We anticipate that contributions can be made to control theory by addressing how

					organizations recognize potential disruptions, prepare for those challenges, and overcome surprises in an effective way’
Koronis and Ponis	2018	Beliefs	Anticipation, coping, adaptation	Proactive, concurrent, reactive	‘management theory and business executives need to further explore their capacity to absorb and adapt in a changing environment full of strategic challenges, emerging crises and sudden and unexpected accidents and disasters.’ [...] ‘Our proposed framework, based on a review of extant literature [...] integrates the four drivers of resilience under a common set of social capital and organizational values, including trust, perceived organizational identity and an error-friendly culture. The key notion is that resilience requires an open-minded and dedicated spirit, traits which [...] require the existence of core values.’

Barasa et al.	2018	Boundary, interactive	Anticipation, coping, adaptation	Proactive, concurrent, reactive	<p>‘The resilience of organizations was influenced by the following factors: Material resources, preparedness and planning, information management, collateral pathways and redundancy, governance processes, leadership practices, organizational culture, human capital, social networks and collaboration.’ [...] ‘Governance practices are also shown to influence the resilience of organizations to both acute and everyday challenges, in both health and other sectors. Governance is used here to mean the rules and processes that guide operations and affairs of organization. A number of governance practices are identified as critical for organizational resilience. The first is decentralization; resilient organizations adopted a form of governance characterized by distributed control, rather than top down hierarchy, under central control.’ [...] ‘Another governance practice that distinguished resilient from non-resilient organizations was non-linear planning.’ [...] and was instead replaced by a non-linear approach that was evolving, open-ended, iterative,</p>
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					and characterized by feedback loops between stages, and learning by trial and error.’
Beuren and d. Santos	2019	Unspecified	Anticipation, coping, adaptation	Proactive, concurrent, reactive	‘understanding the role of MCSs in the creation and use of resilience capacities offers a new way of explaining why some companies manage to outperform others during adverse and turbulent events’ [...] ‘the design and use of an MCS can contribute to the organization’s capacity for dealing with turbulences and unexpected events in advance.’ [...] ‘other taxonomies of MCS could be used to understand how the design and use of an MCS affect organizational resilience capacity.’

Beuren et al.	2020	Unspecified	Anticipation, coping, adaptation	Proactive, concurrent, reactive	‘Thus, it is assumed that the MCS with more flexible characteristics favors changes and helps individuals to face challenges, giving them greater capacity for organizational resilience.’ [...] ‘the combination of managerial practices at the organizational level (MCS), in parsimony with influence at the individual level (empowerment), act together to support organizational resilience.’ [...] ‘Other taxonomies of the MCS can be used to explore the relationship between MCS, [...] and organizational resilience.’
Pal et al.	2014	Unspecified	Coping	Concurrent	‘The role of leadership and management decision-making were influential factors in facilitating resilience during the recent crunch.’ [...] ‘Firms like those could break-away from the ‘command and control culture’ generally prevalent in small family firms, and became more entrepreneurial and open, and showed better economic resilience.’

Tables

Table 1. Number of Results

Database	Search term 1	Search term 2	Results	Selected due title or abstract	Excluded due title or abstract
EBSCO	management control systems	and resilience	339	5	334
EBSCO	levers of control	and resilience	64	1	63
EBSCO	organizational resilience		1.296	23	1.273
EBSCO	organisational resilience		316	5	311
EBSCO	organizational	and resilience	9.771	21	9.750
EBSCO	organisational	and resilience	3.521	2	3.519
EBSCO	levers of control		1.594	24	1.570
EBSCO	management control systems		9.720	19	9.701
			Total EBSCO*	100	
ScienceDirect	organizational resilience		1.036	11	1.025
ScienceDirect	organisational resilience		1.036	11**	1.025
ScienceDirect	levers of control		1.051	11	1.040
ScienceDirect	management control systems		24.276	25	24.251
			Total ScienceDirect	58	
			Total after deleting duplicates in Science Direct and EBSO	123	
			Added after checking references	32	
			Total	155	

* Duplicates were automatically removed via EBSO folder.

** The search produced the same results as the search term 'organizational resilience'.

Table 2. Description, Explanation, and Value of the Citation Network Analysis Metrics
(*HITS*, *Eigenvector Centrality*, *Average Path Length*, and *Modularity*)

Metric	Description	Explanation	Value
<i>HITS</i>	calculates <i>Hubs Distribution</i> and <i>Authority Measures</i>	Hyperlink-induced topic search (~page authority in web)	$1.0 * 10^{-4}$
<i>Eigenvector Centrality</i>	calculates the directed sum of change in terms of <i>Eigenvector Centrality</i> with 100 iterations	[0, 1] gives influence between nodes	0.0093
<i>Average Path Length</i>	calculates the directed path length and diameter of the network	Diameter is the maximal distance between two nodes	2.017 average path-length; 5 diameter
<i>Modularity</i>	randomized, edge-weighted community creation	[-1, 1] gives the structure of networks; density of connections	0.788

Table 3. Distribution of Publications that we found among Various Journals in the Field of MCS and Organizational Resilience

Journals	Number	Category
Accounting, Organizations & Society	18	MCS
Management Accounting Research	18	MCS
International Journal of Production Research	9	OR
Harvard Business Review	4	MCS
International Journal of Production Economics	5	OR/MCS
Journal of Business Continuity & Emergency Planning	4	OR
European Management Journal	3	OR/MCS
Journal of Management Accounting Research	3	MCS
Strategic Management Journal	3	MCS/OR
The British Accounting Review	3	MCS
Academy of Management Journal	2	OR/MCS
Applied Psychology: An International Review	2	OR
Brazilian Business Review	2	OR
Business Research	2	OR
European Accounting Review	2	MCS
Handbooks of Management Accounting Research	2	MCS
Journal of Accounting & Organizational Change	2	MCS
Journal of Cleaner Production	3	MCS
Journal of Contingencies & Crisis Management	2	OR
Natural Hazards Review	2	OR
Omega	2	OR/MCS
Strategic Direction	2	OR/MCS
Others (only one publication per journal)	60	OR/MCS
Total	155	

Table 4. Number of Times cited, *Authority*, *Eigenvector Centrality*, and *Betweenness Centrality* of Relevant Publications

Publication	Number of Times Cited⁵	<i>Authority</i>	<i>Eigenvector Centrality</i>	<i>Betweenness Centrality</i>
Abernethy and Brownell (1999)	1.066	0.9528	1.0	11872
Abernethy and Brownell (1997)	646	0.2058	0.5043	2202
Abernethy et al. (2010)	237	0.0323	0.1906	1872
Annarelli and Nonino (2016)	230	0.0020	0.0753	1201
Abdullah et al. (2013)	21	0.0030	0.2333	-
Abernethy et al. (2004)	376	0.0827	0.2122	1685
Adler et al. (1996)	2.654	0.0069	0.0635	1277
Acquaah et al. (2011)	101	0.0072	0.2881	388
Alesch et al. (2001)	236	0.0037	0.0895	92
Adger (2000)	4.992	0.0025	0.2011	261
Aguilar (1967)	3.255	0.0486	0.1477	-
Acikgoz et al. (2016)	15	-	0.1868	-
American Accounting Association (1971)	54	0.0262	0.1856	-
Abernathy and Utterback (1978)	205	0.0316	0.1763	-

⁵ We determine the number of citations, using a search with Google Scholar in January 2021.

Table 5. Representative Publications from Each of the Six Communities, the Number of Times the Publications were cited, the Number of Publications in Each Community, and Their Percentage of the Total Citation Network

Community	#	Color	Representative Publication/s	Number of Publications	Percentage of the Total Citation Network [%]	Number of Times Cited ⁶
<i>Accounting</i>	I	Orange	Abernethy and Brownell (1999)	714	10.46	1066
<i>Management Control Systems</i>	II	Purple	Abernethy and Brownell (1997)	460	6.74	646
			Abernethy and Chua (1996)			785
<i>Innovation</i>	III	Pink	Abernathy and Utterback (1978)	361	5.29	205
			Abrahamson (1991)			3456
			Andriopoulos and Lewis (2008)			1962
<i>Resilience</i>	IV	Yellow	Annarelli and Nonino (2016)	354	5.19	230
			Allen and Powell (2012)			48
			Almedom (2005)			329
			Thomas et al. (2013)			58
<i>Sustainability</i>	V	Green	Adams et al. (2016)	290	4.25	590
			Adger et al. (2009)			2524
<i>Organizational Development & Vulnerability</i>	VI	Blue	Adger (2000)	285	4.18	4992
			Adger (2006)			6556
			Bohn (2010)			40
			Ghobadian and Gallear (1997)			625

⁶ We determine the number of citations using a search with Google Scholar in January 2021.

Table 6. Number of Citations in Simons' Publications relating to Duchek's (2020) Organizational Resilience Stages, using a 5 × 3 Matrix

		Duchek's (2020) organizational resilience framework		
		Anticipation stage	Coping stage	Adaptation stage
Simons' levers of control	Beliefs systems	0	0	2
	Boundary systems	1	0	6
	Diagnostic control systems	0	1	2
	Interactive control systems	8	1	17
	Unspecified	0	0	6

Table 7. Number of Citations in the LOC and MCS Literature relating to Duchek’s (2020) Organizational Resilience Stages, using a 5 × 3 Matrix

		Duchek's (2020) organizational resilience framework		
		Anticipation stage	Coping stage	Adaptation stage
Simons' levers of control	Beliefs systems	0	0	0
	Boundary systems	0	0	0
	Diagnostic control systems	1	0	0
	Interactive control systems	1	5	1
MCS	Unspecified	0	0	2

Table 8. Number of Citations in the Organizational Resilience Literature relating to MCS or LOC, using a 5 × 3 Matrix

		Duchek's (2020) organizational resilience framework		
		Anticipation stage	Coping stage	Adaptation stage
Simons' levers of control	Beliefs systems	3	3	3
	Boundary systems	0	0	0
	Diagnostic control systems	0	0	0
	Interactive control systems	3	3	3
MCS	Unspecified	5	6	5

Figures

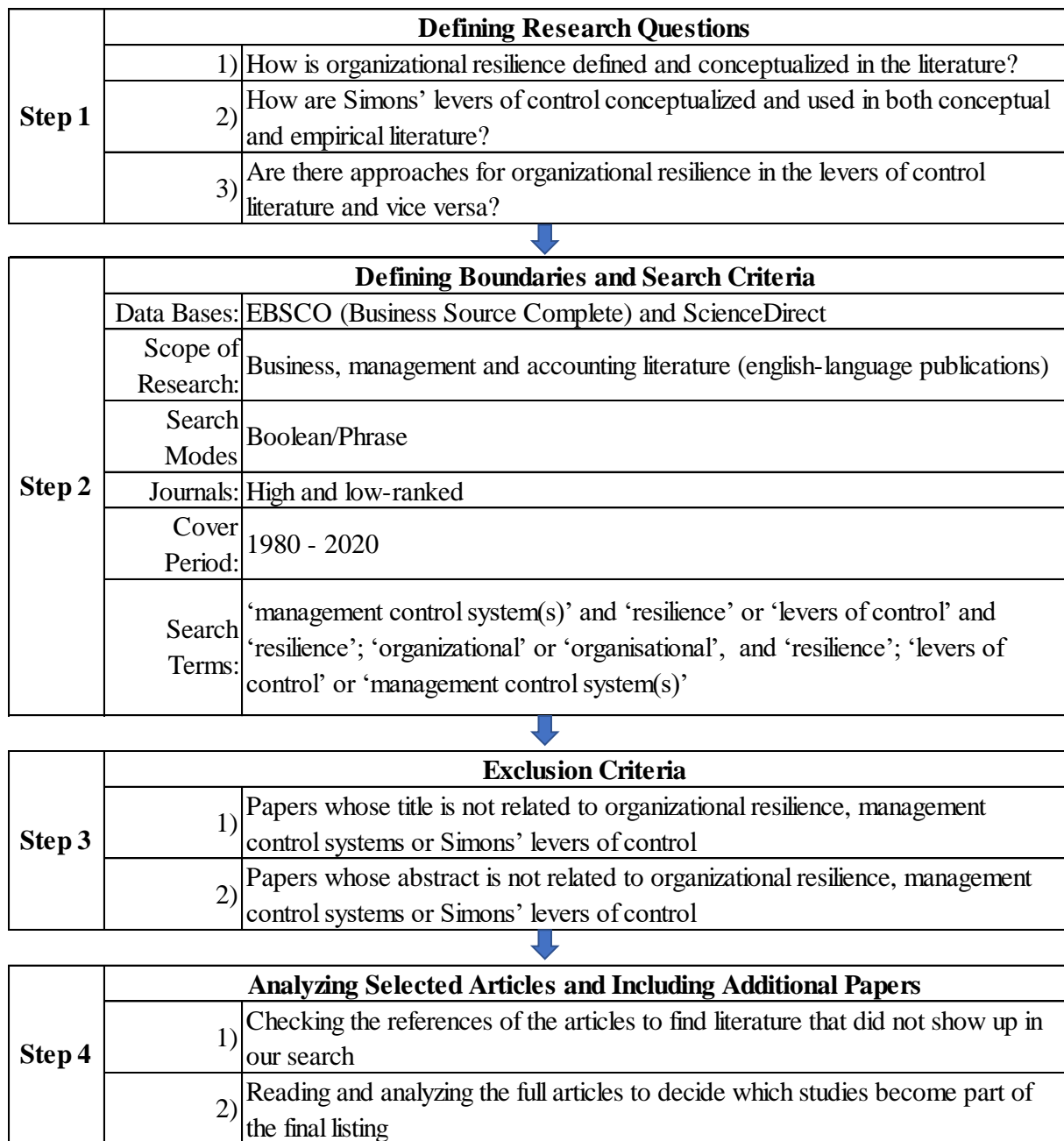


Figure 1. Research Protocol

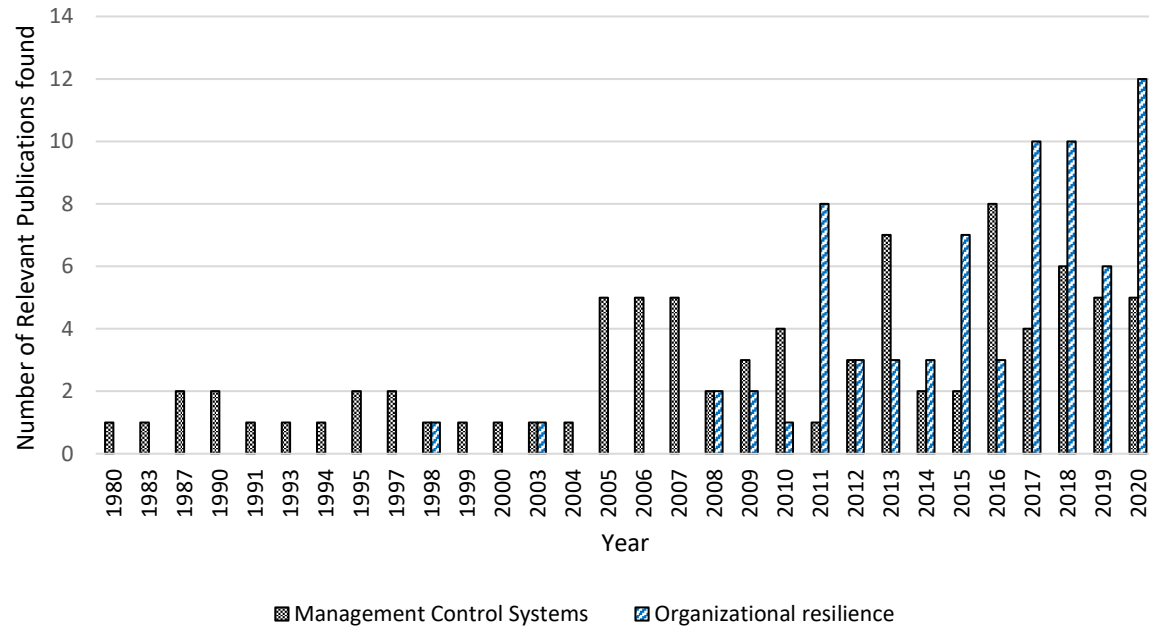


Figure 2. Temporal Distribution of Relevant Publications that we found in the field of Organizational Resilience and MCS between 1980 and 2020 (total 155)

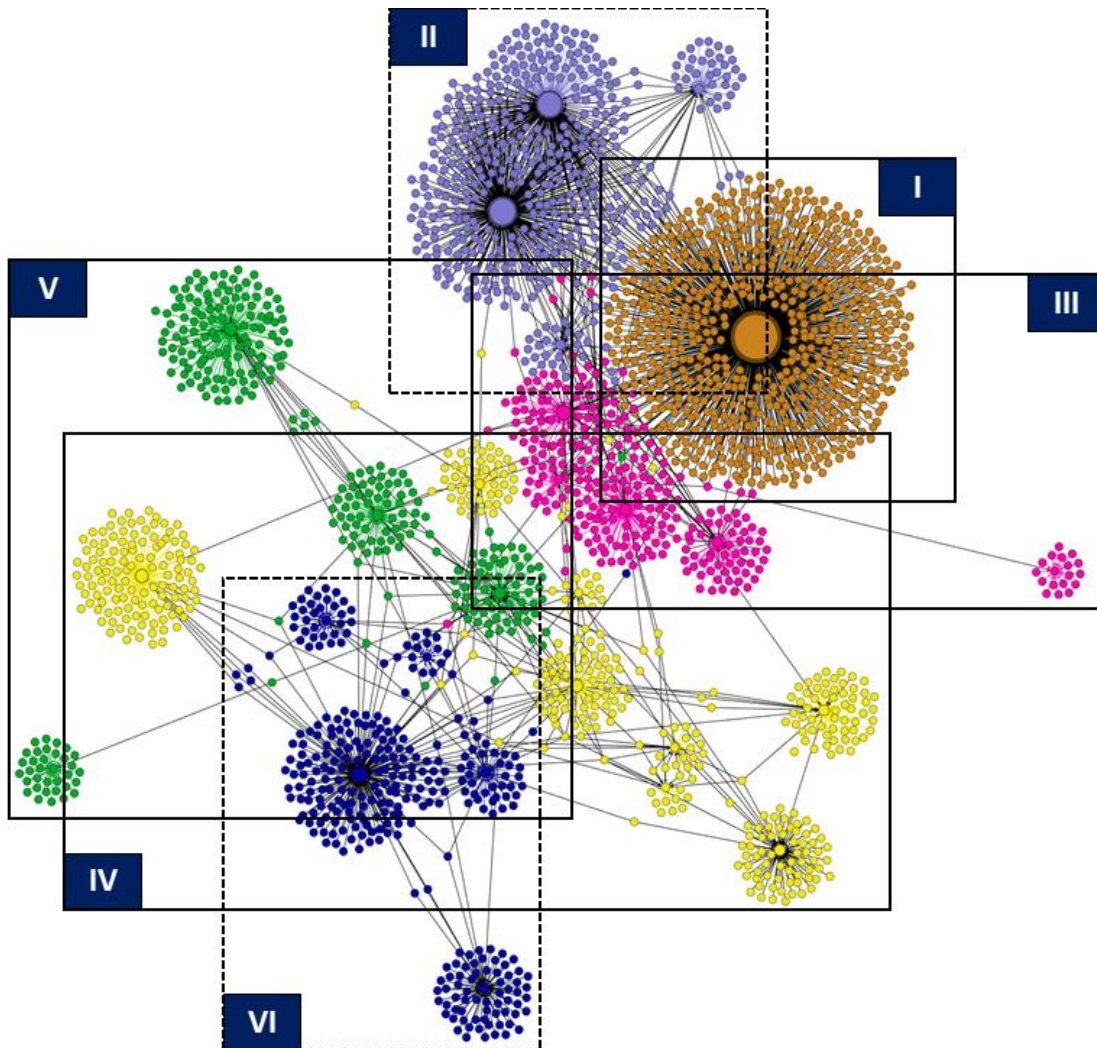


Figure 3. Citation Network with Degree > 2 and Size equal to Significance in *Eigenvector Centrality* and Colors representing the Top Six *Modularity Communities* (Orange I: *Accounting*; Purple II: *Management Control Systems*; Pink III: *Innovation*; Yellow IV: *Resilience*; Green V: *Sustainability*; Blue VI: *Organizational Development & Vulnerability*)

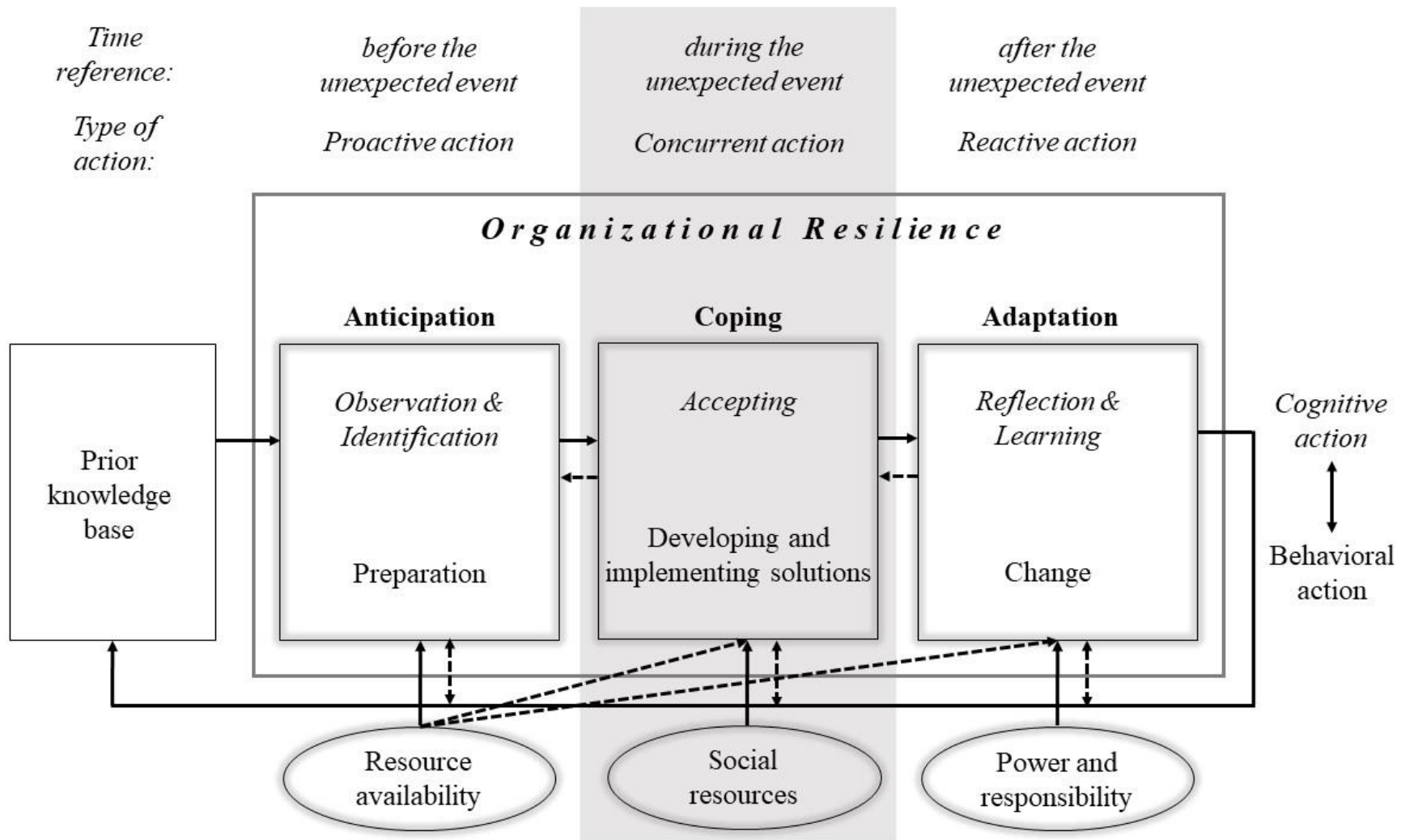


Figure 4. A Capability-Based Conceptualization of Organizational Resilience according to Duchek (2020)

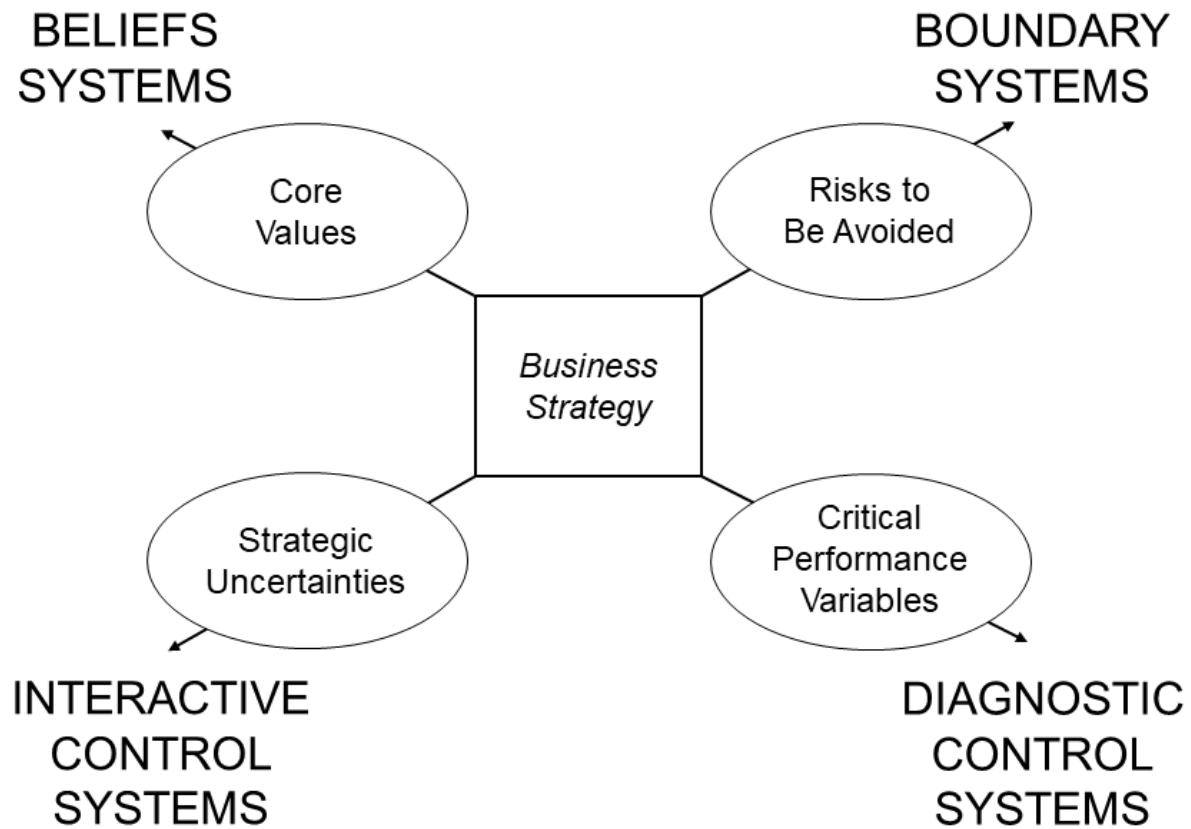


Figure 5. The Four Levers of Control according to Simons (1995b)