

# **Resilience in Business and Management Research: A Review of Influential Publications and a Research Agenda**

Martina Linnenluecke  
UQ Business School  
The University of Queensland  
St Lucia, QLD 4072, Australia  
Phone: +61 7 3346 8115  
Email: [m.linnenluecke@business.uq.edu.au](mailto:m.linnenluecke@business.uq.edu.au)

Linnenluecke, Martina K. "Resilience in business and management research: A review of influential publications and a research agenda." *International Journal of Management Reviews* 19.1 (2017): 4-30.  
Uncorrected version.

# **Resilience in Business and Management Research: A Review of Influential Publications and a Research Agenda**

## **ABSTRACT**

This paper identifies the knowledge development and knowledge gaps in business and management research on resilience, based on a systematic review of influential publications among 339 papers, books and book chapters published between 1977 and 2014. Analyzing these records shows that resilience research has developed into five research streams, or lines of enquiry, which view resilience either as (1) organizational responses to external threats, (2) organizational reliability, (3) employee strengths, (4) the adaptability of business models, or (5) design principles that reduce supply chain vulnerabilities and disruptions. A review of the five streams suggests three key findings: First, resilience has been conceptualized quite differently across studies, meaning that the different research streams have developed their own definitions, theories and understandings of resilience. Second, conceptual similarities and differences among these streams have not yet been explored, nor have insights been gleaned about any possible generalizable principles for developing resilience. Third, resilience has been operationalized quite differently, with few insights into the empirics for detecting resilience to future adversity (or the absence thereof). This paper outlines emerging research trends and pathways for future research, highlighting opportunities to integrate and expand on existing knowledge, as well as avenues for further investigating resilience in business and management studies.

*Keywords:* bibliometric analysis, systematic review, resilience, resiliency, business, management

## INTRODUCTION

Unexpected events and abrupt changes often surprise organizations. Natural disasters disrupt supply chains, terrorist attacks shock the public and paralyze financial markets, and industrial accidents have major ecological and economic consequences which ripple through supply chains, from raw materials to transportation. Case and anecdotal evidence exemplifies that some organizations are more successful in responding to (or even surviving) unexpected, abrupt and/or 'extreme' events than others under similar circumstances (Fiksel *et al.* 2015; Gittell *et al.* 2006). But what makes some organizations more successful in dealing with, and responding to, the unfamiliar? The term 'resilience' has been used at the organizational level to describe the inherent characteristics of those organizations that are able to respond quicker, recover faster, or develop more unusual ways of doing business under duress than others (e.g., Sutcliffe and Vogus 2003; Vogus and Sutcliffe 2007). At the employee level, the term has been used to refer to the ability of organizational members to bounce back, and even succeed, in the face of problems and adversity (e.g., Luthans *et al.* 2010; Shin *et al.* 2012).

Resilience is generally seen as a desirable characteristic for an organization (and for its members) to possess in order to deal with various types of adversity. 'Resilience' sometimes refers to rigidity, for instance, an organization's inability or unwillingness to change due to a deeply entrenched organizational culture (see Davies and Thomas 2003; Linnios *et al.* 2014); however, the term more commonly refers to both organizational and employee strength, perseverance and recovery when encountering adversity. Although 'resilience' is an increasingly common theme in academic research, business practice, public policy and the popular press, its conceptualization and operationalization have been quite varied across studies. A number of commentators (Klein *et al.* 2003; Manyena 2006) have argued that – in order for resilience to be a useful and valid concept – it is necessary to have a

solid understanding of the origin of the concept and how it is defined, by which variables it is determined, and how it can be assessed, maintained and improved over time.

As a first step in this direction, this paper identifies the knowledge development and knowledge gaps in business and management research on resilience. The bibliographic mapping and visualization software *HistCite*<sup>TM</sup> was used for the analysis. The software produces genealogical maps of publications within a field of research which provide insights into a field's structure and history (Garfield 2004; van Eck & Waltman, 2014). Using the *HistCite*<sup>TM</sup>-generated bibliographic map as guidance, this paper identifies influential publications on resilience in business and management research and their interrelations, and reviews key lines of enquiry, their theoretical underpinnings and their contributions to understanding resilience. Findings from the review show the fragmented conceptualization and operationalization of the concept across five research streams which view resilience either as (1) organizational responses to external threats, (2) organizational reliability, (3) employee strengths, (4) the adaptability of business models, or (5) design principles that reduce supply chain vulnerabilities and disruptions. The paper outlines emerging research trends and pathways for future research, highlighting opportunities to integrate and expand on existing knowledge as well as avenues for further investigating resilience in business and management studies.

## **METHODOLOGY: MAPPING RESILIENCE IN BUSINESS AND MANAGEMENT RESEARCH**

Bibliographic mapping is an established approach for reviewing a field of research and its influential publications, and allows for an objective assessment of the development of thought on a topic (Börner *et al.* 2003; Janssen *et al.* 2006; Janssen 2007). A central part of this technique is the production of a bibliographic map of the topic of interest for visualizing the intellectual origins of that topic and the structure of the literature over time. Data

collection and analysis follow the methodological steps outlined by Janssen *et al.* (2006) and Janssen (2007). The first step is the compilation of a comprehensive dataset of relevant publications and their citation records (i.e., a full record of their cited references). Next, the citation data need to be cleaned. The data can then be analyzed and correlated using *HistCite*<sup>TM</sup> to map relationships between publications, and the results can be visualized by the software for means of communication. Each of these steps is detailed below.

### **Data collection and data cleaning**

Publications for inclusion in this review were identified through Boolean searches within the Social Sciences Citation Index, an online academic citation database within the Thomson Reuters *Web of Science*<sup>TM</sup> platform. Within this database, a search was conducted for publications with the term “resilien\*” in the title, abstracts or keywords. The asterisk (\*) was included as a wildcard symbol to search for variations of the term resilience (such as resilient or resiliency). To ensure that the search was not too broad and focused on business and management research, it was limited to publications classified as belonging to the areas of “business” or “management”. The comprehensive list of journals that are included in these areas can be accessed from the *Web of Science*<sup>TM</sup> website. The search found 453 records.

The 453 records were downloaded and imported into *HistCite*<sup>TM</sup> (version 12.03.17). The records were manually cleaned by two reviewers who were asked to check the title, abstract and keywords of each record, and, if necessary, refer to the full text of the publication to determine its suitability for inclusion in the review. In cases where both reviewers agreed that a publication should not be part of the analysis, it was removed. Cases of disagreement were referred back to both reviewers for re-evaluation. Removed publications used the term “resilience” in the abstract or keywords, but did not further elaborate the concept or relate the concept to organizations or management. For example, Dongsheng *et al.* (2002) reported in their abstract that “trends in advertising demonstrated

resilience”, yet this is the only instance the paper refers to resilience. As a result of the data cleaning, 131 records were removed, leaving 322 records in the dataset.

### **Manual additions to the dataset**

To check if any records were inadvertently overlooked, a cited reference search was conducted within *HistCite*<sup>TM</sup>. Omissions can occur when a record does not meet the search criteria (i.e., it does not contain the search term “resilien\*” in the title, abstract or keywords) or when a record is among the publication sources not systematically indexed in the *Web of Science*<sup>TM</sup> database (such as books or book chapters). Furthermore, restricting the search to the field of business and management may have missed contributions not classified by the *Web of Science*<sup>TM</sup> as belonging to this domain. The cited reference search shows all references cited by publications within the dataset and allows the user to identify publications that have been cited (and are thus possibly relevant to the topic under investigation), but that are not included in the data collection themselves (Garfield 2004). The cited reference search identified 17 additional publications which were manually added to the final dataset (including seven books and two book chapters, see Table 1). It should be noted that, while publications in the dataset cite works from the psychology literature, there are few citations to studies from ecology or engineering (even though both fields have a significant history in resilience research).

-----  
Table 1 here  
-----

In addition, manual editing of records was undertaken to unify citation records where needed, as inconsistencies can result from differences in journal styles or incorrect spellings of author names. Such inconsistencies can be problematic as *HistCite*<sup>TM</sup> cannot identify connections between publications and visualize these connections when publications are cited

inconsistently. With the manual additions, the final dataset contained 339 records across 133 publication sources, published between 1977 and 2014 (cut off: 31 August 2014 which includes online first articles published up to this point).

## **RESULTS: CITATION STATISTICS AND CITATION MAP**

The yearly output of research on resilience in the field of business and management is mapped in Figure 1. Since about 2000, there has been an exponential increase in publications on resilience. This may reflect post-9/11 concerns about terrorism, but also about the growing complexity and interdependence of socio-economic, financial, and technological systems and the associated heightened risk of failure (e.g., Allen and Powell, 2013; Kambhu *et al.* 2007). The citation map generated with *HistCite*<sup>TM</sup> (see Figure 2) illustrates the most highly cited publications within the dataset along a timeline (left side of figure). Papers are displayed as nodes and citation connections between them as arrows. The size of each node highlights the quantitative importance of the respective publication in the map. The arrows do not reveal why one paper cites another paper; this information can only be determined by closer examination of the respective publications and is outlined in further detail throughout this paper. Nonetheless, the citation graph allows the identification of knowledge development and knowledge gaps in a particular field, as researchers typically cite the prior research they build upon. Corresponding citation details and citation counts for each node in Figure 2 can be found in Table 2.

-----  
Figures 1 & 2 here; Table 2 here  
-----

The review (and display of publications in Figure 2) was limited to the more highly cited publications to focus on those that were influential in business and management research on resilience (as evidenced through their citation count) and to also maintain visual

clarity of Figure 2 due to the density of citation links. There is no hard rule as to where the cutoff should be set; however, it is typically set at a point where the citations are levelling off due to an exponentially decreasing citation count. In this paper, this point was at a Local Citation Score (LCS) of  $\geq 5$ , which refers to the count of citations to each publication within the dataset. Of the 339 records in the dataset, 249 records were not cited by other publications within the dataset (LCS of 0). A large proportion of publications therefore had little influence on the academic debate on resilience to date. A similar picture emerges when looking at the Global Citation Score (GSC) of each paper, which refers to the count of citations to each publication within the *Web of Science*<sup>TM</sup>. Of the 339 records in the dataset, 116 records were not cited by other publications within the *Web of Science*<sup>TM</sup> (GCS of 0).

## **DEVELOPMENTS IN RESILIENCE RESEARCH**

This section reviews and discusses the main research streams displayed in Figure 2 (grey-shaded for clarity). These streams can be regarded as different lines of enquiry into resilience which developed in the business and management literature over time and share a distinct definition, theory or understanding of resilience. Following the review, the paper summarizes emerging research trends among recently published papers which have not yet attracted enough citations to be included on the citation map. It outlines knowledge gaps and opportunities to integrate and expand on existing knowledge, and concludes with pathways for future research.

### **Conceptual origins: Organizational responses to external threats**

The origins of the resilience concept in the business and management literature can be traced back to two seminal papers by Staw *et al.* (1981) and Meyer (1982), displayed at the top of Figure 2. Both papers draw upon variation-selection-retention mechanisms posited by evolutionary theory (see Campbell, 1965, 1969, outside the scope of this review), but developed very different propositions regarding how organizations respond to external



threats. Staw *et al.* (1981) introduced theory on how negatively framed situations lead to risk avoidance and maladaptive outcomes in the form of “threat-rigidity effects” due to an overall tendency for individuals, groups, and organizations to emphasize well-learned or dominant responses when facing adversity (rather than flexible and adaptable learning). Meyer (1982) extended this line of enquiry in an empirical study of hospital responses to an unexpected doctors’ strike or ‘environmental jolt’, but contradicted the proposition by Staw *et al.* (1981) that an external threat automatically places an organization at risk. Findings from Meyer’s study suggested that organizations can display adaptability in the form of two different types of responses: they can either absorb the impact of the environmental jolt by undergoing first-order change and single-loop learning (labelled “resiliency”), or they can adopt new practices or configurations through second-order change and double-loop learning (labelled “retention”). Meyer (1982) further concluded that resiliency is influenced by an organization’s strategy and its slack resources, while retention is shaped by an organization’s ideologies and constrained by organizational structures.

-----  
Table 3 here  
-----

Staw *et al.* (1981) and Meyer (1982) contributed to the literature by observing that the way in which organizations respond to external threats triggers organizational processes which can either lead to a functional and dysfunctional (or successful and unsuccessful) response, influencing an organization’s strategic positioning and even its survival. However, the tensions between the propositions in the two papers and some other important questions have not been fully resolved to date; in particular, if and how organizations can avoid threat-rigidity and “activate” resilience in response to threat, and how resilience can successfully be built across individual, group, and organizational levels of analysis. This is likely because resilience research from the mid-1980s onwards (reviewed in the next section) focused on

*firm-internal* disruptions leading to industrial accidents and the reliability of high-risk technologies. It was only after 9/11 that resilience research reemphasized the importance of *external* threats and thus began to revisit Staw *et al.*'s (1981) and Meyer's (1982) contributions (see section on "The adaptability of business models"). The papers by Staw *et al.* (1981) and Meyer (1982) therefore initially had little influence on the resilience field, even though Meyer (1982) was the first to expressly use "resiliency" as a concept within the business and management literature.

### **The 1980s and 1990s: Resilience as reliability**

From the 1980s onwards, large-scale accidents and disasters such as Chernobyl, Exxon Valdez, Bhopal and the Space Shuttle Challenger accident generated significant interest in researching their causes and consequences. Academic interest shifted from *external* events and their consequences for organizations (reviewed above) towards *internal* organizational reliability; in particular, the reliability of complex intra-organizational processes and the avoidance of small failures, deviations and other malfunctions which could potentially escalate into high-consequence events (see the summary in Table 4). Case studies were the main methodological tool for attempting to capture these processes. The resilience literature reviewed in this section developed alongside a larger body of work on topics such as risk and crisis management and practice-led work about emergency planning and business continuity, comprehensively reviewed elsewhere (e.g., Shrivastava 1994, 1995; Pearson & Clair 1998; Smith and Elliott 2006).

-----  
Table 4 here  
-----

Perrow's (1984) book (see Figure 2) introduced the first major theoretical contribution on resilience as reliability, *Normal Accident Theory*, and proposed that high-risk

technological systems are vulnerable to failure because they are becoming increasingly complex and difficult for personnel to operate. The Three Mile Island nuclear power station accident illustrates the characteristics of a “normal accident”: A small failure in a secondary, non-nuclear section of the power station triggered increasingly serious failures which operators were unable to diagnose and respond to, resulting in a rapidly escalating incident and partial nuclear meltdown. However, Normal Accident Theory soon came under criticism for its deterministic stance and proposition that major accidents are inevitable for technological reasons and should be considered as a ‘normal’ consequence (rather than an exceptional occurrence) in complex and tightly-coupled systems (e.g., Hopkins, 1999).

Nonetheless, Normal Accident Theory gave rise to a “reliability paradigm” (Van Den Eede *et al.* 2006) which showed itself through greater attention to operational safety and reliability in organizational research and practice. Wildavsky’s 1988 book, *Searching for Safety* (see Figure 2), reflected this paradigm and analyzed the considerable degree of safety that society had thus far achieved. Wildavsky concluded that two strategies were important in responding to the dangers introduced by technological progress: (1) anticipation (or stability) as a strategy to assess vulnerability and avoid potential dangers, and (2) resilience as “the capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back” (pg. 77). This definition suggested that resilience is a generalized capacity to learn and to act without knowing in advance the situation or event that needs to be acted upon, which was later seen as an important aspect of High Reliability Organizing (reviewed below).

Subsequent studies focused on investigating how organizations can prepare for future unknown challenges. Sitkin (1992) (see Figure 2) recommended that managers should not try to avoid failure, but foster “intelligent failure” (i.e., experimentation) as an essential part of effective organizational learning processes, also to ensure that minor failures do not to

continue and intensify into a major incident. However, researchers increasingly grappled with the issue of how learning takes place in tightly coupled organizational systems where the scale of consequences precludes learning through experimentation (as proposed by Sitkin). A group of researchers at the University of California at Berkeley began to observe organizations that operate high-hazard technologies and require error-free performance to avoid major catastrophes (aircraft carriers, the U.S. Air Traffic Control system, nuclear power plants) to analyze how they avoid accidents and failures, even though they continuously operate under vastly complex conditions. The researchers concluded that the error-free performance is not just brought about by not failing (despite the potential to do so, see Roberts 1990), but by an active search for reliability, thus giving rise to *High Reliability Organizing* as a second major theory alongside Normal Accident Theory. High-reliability organizations have therefore also been described as reliability-seeking, rather than reliability-achieving entities (see Rochlin 1993, Sutcliffe 2011).

One of the highly cited contributions from this period (see Figure 2) is the paper by Weick and Roberts (1993) on the operation of aircraft carrier flight decks. The authors coined the concept of 'collective mind', defined as "a pattern of heedful interrelations of actions in a social system" (pg. 357), and developed the hypothesis that increases in heedful interrelating and mindful comprehension of unfolding events decrease the potential for organizational errors. In other words, the authors suggested that high-reliability organizations enact aggregate mental processes (information processes, heedful action, and mindful attention) that are more fully developed than those in organizations that are primarily concerned with efficiency. Processes of sensemaking were also an important aspect of Weick's (1993) study, which was published alongside the paper by Weick and Roberts (1993). Weick analyzed how a group of smokejumpers responded to the Mann Gulch disaster and concluded that several

factors contribute to organizational resilience, including the ability to improvise, virtual role systems, organizational wisdom and respectful individual and social interactions.

Further research on high reliability organizations (see Figure 2) continued to explore how these organizations find ways to address challenging conditions and problems as they occur and before their effects escalate (see Weick *et al.* 1999; Weick and Sutcliffe 2001). A key paper that reinvigorated research on High Reliability Organizing and moved it into mainstream organizational theory was Weick *et al.*'s (1999) reconceptualization of the high reliability literature. Weick and colleagues proposed that high reliability organizations embody processes of mindfulness that suppress tendencies toward inertia, including a preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience (in the sense of Wildavsky's definition), and underspecified structuring. The authors conceptualized resilience not as an outcome variable, but as a mindful process leading to reliability. The construct of mindfulness was further elaborated by Weick and Sutcliffe (2001) in their book *Managing the Unexpected*, and refined in later editions. The underlying proposition of their work was that accidents or catastrophic failures can be forestalled by ongoing small adjustments that prevent errors from accumulating.

Combined, the studies within this research stream have created a wealth of knowledge on safety and reliability. High Reliability Organizing has emerged as the dominant theory; probably because it is less 'deterministic' and because it is pursued by a dedicated research group at Berkley (Smart *et al.* 2003). However, several points remain unresolved. Among those is the conceptual relationship between High Reliability Organizing and Normal Accident Theory. Some researchers regard the theories as fundamentally different; others see High Reliability Organizing as an extension of Normal Accident Theory because it considers high-risk technologies, but is focused on those organizations that take extraordinary steps to achieve error-free performance (Brown 1993, Smart *et al.* 2003). Rudolph and Repenning

(2002) argued that both theories have blind spots as they do not consider the role and accumulation of non-novel events in organizational accidents and disasters. Their research (see Figure 2) suggests that an over-accumulation of interruptions past a certain threshold can shift an organization from a resilient to a fragile, self-escalating regime that amplifies failure. Other unresolved points (see Discussion) include to what extent and how the principles of High Reliability Organizing can be transferred across organizations to create resilience in other contexts (Boin & Hart 2010).

### **Resilience post 9/11**

Preoccupation with internal organizational responses to accidents, disruptions, crises and disasters came to an abrupt end following the events of 9/11. The 2001 terrorist attacks in the US had profound impacts on resilience research, ending the predominant concern with intra-organizational reliability and shifting attention to coping mechanisms and response strategies under conditions of great environmental uncertainty. At that time, the concept of resilience also appeared in regulatory settings. For instance, the US Board of Governors of the Federal Reserve System, in conjunction with the Office of the Comptroller of the Currency and the Securities and Exchange Commission, introduced Guidelines for Strengthening the Resilience of the US Financial System (see Hiles 2010). The three research streams that followed, reviewed in the following sections, drew largely upon new conceptual foundations for studying resilience, but also included a line of enquiry which revisited earlier work (see section on “The adaptability of business models”). These streams have developed in relative isolation from each other (only a handful of connections exist between the left and right side of Figure 2). Opportunities for integration have not yet been explored, and are outlined in the Discussion section of this paper.

***Managing employee strengths:*** The first stream of post-9/11 research on resilience, reviewed in this section and summarized in Table 5, started with the works of Coutu (2002)

and Luthans (2002a, 2002b) and developed into a new line of enquiry on building resilience through employee strengths. This research stream (see right side of Figure 2) is separate from prior work and has theoretical origins in the clinical and developmental psychology literatures. Publications within this stream drew on Bandura's (1997) work on *Self-Efficacy*, concerned with individuals' beliefs in their own abilities and associated performance accomplishments, and Seligman's (1998) work on *Learned Optimism*, concerned with how individuals' optimistic or pessimistic thoughts about events in their lives change what ensues. The research stream reflects the positive scholarship movement that emerged at the time (Cameron *et al.* 2003) and was based on strong beliefs that (and especially post-September 11) more attention should be directed towards nurturing the "good" in people and organizations, including optimism, hope, and resilience (e.g., Luthans, 2002b). While this research stream began with conceptual work, it resulted in quantitative studies and measures.

-----  
Table 5 here  
-----

Coutu's (2002) paper put forward the idea that employee capabilities are important for building resilience. Coutu used Morgan Stanley's response to the 9/11 attacks as a case example to demonstrate how confrontation with reality (the earlier 1993 World Trade Centre attack) had allowed the company to recognize the need to implement a company-wide disaster preparedness program, resulting in the successful evacuation of most of its 2,700 employees across 22 floors in the 9/11 attacks. Luthans (2002a, 2002b), on the other hand, advanced research on how to develop and manage psychological strength in employees. Luthans (2002b) proposed that one of variables leading to psychological strength is resiliency, defined as "the capability of individuals to cope successfully in the face of significant change, adversity, or risk" and as "the positive psychological capacity to rebound,

to ‘bounce back’ from adversity, uncertainty, conflict, failure or even positive change, progress and increased responsibility” (pg. 702).

A significant body of research developed around psychological capital development in organizations (see right side of Figure 2). Much of the subsequent literature in this research stream drew upon the initial definition of resiliency by Luthans (2002b), or variations thereof (see also Table 5). Luthans *et al.* (2006) extended Luthans’ (2002b) conceptualization of employee strengths by introducing the so-called psychological capital (or PsyCap) measures as a new theoretical underpinning of positive organizational behavior. PsyCap was conceptualized as consisting of four synergistic factors (self-efficacy, optimism, hope, and resiliency). Luthans *et al.* (2006) argued that resilience can be developed through employee intervention strategies, for instance, by asking organizational members to identify personal setbacks within their work domain, to assess the realistic impact of their setback, and to identify options for taking action. Resilience in this context is seen as a contributing factor towards employee psychological capital.

Several studies on the right side of Figure 2 investigated correlations between the PsyCap measure (and/or its individual factors) and work-related outcomes. They found positive correlations between PsyCap and job satisfaction, work happiness, organizational commitment and performance (Luthans *et al.* 2007; Youssef and Luthans 2007), as well as negative correlations between PsyCap and employee stress, intentions to quit and job search behaviors (Avey *et al.* 2009). PsyCap was also found to be related to positive employee emotions, which in turn were related to attitudes and behaviors relevant to organizational change (Avey *et al.* 2008). However, the operationalization and measurement of PsyCap (and resilience) varied across studies. Youssef and Luthans (2007) adopted Block and Kremen’s (1996) ego-resiliency scale, designed to measure an individual’s positive engagement with the world, while Luthans *et al.* (2007) developed a composite PsyCap measure that included a



6-item measure for resilience, adapted from Wagnild and Young's (1993) measure of resilience in health and nursing. The composite PsyCap measure was also used by Avey *et al.* (2008), Avey *et al.* (2009), Luthans *et al.* (2008), and Luthans *et al.* (2010).

Overall, this stream of literature suggests that resilience is a learnable capacity which can be measured and developed within employees, and which sets them up for success or failure independent of their real ability to cope with unfamiliar events. Resilience has thereby been conceptualized as a factor of psychological capital (e.g., Luthans *et al.* 2006) and regarded as amenable to managerial intervention. Organizations are assumed to be in a position to build psychological capital through developmental processes which, in turn, improve employees' abilities to cope with change, adversity, or risk. Researchers started to investigate ways to effectively develop and improve resilience (and psychological capital more generally) over time, including employee development options such as web-based and short training interventions (Luthans *et al.* 2008; Luthans *et al.* 2010). However, this literature raises questions (see Discussion) as to what extent employee strengths (self-efficacy, optimism, hope, and resiliency) fundamentally contribute to resilience, and as to how important employees are to aspects such as mindfulness and information processing.

***The adaptability of business models:*** A second stream of post-9/11 research has focused on understanding how companies adjust, adapt and reinvent their business models in an ever-changing environment (and, ideally, before they are forced to do so by external circumstances). Authors renewed their interest in the organizational processes that can either lead to a functional and dysfunctional (or successful and unsuccessful) response to adverse, external change (Meyer, 1982, Staw *et al.* 1981) and investigated enabling conditions that allow companies to be resilient. Highly cited publications in this line of enquiry include Sutcliffe and Vogus (2003), Hamel and Valikangas (2003), and Gittell *et al.* (2006), summarized in Table 6.

-----  
Table 6 here  
-----

Sutcliffe and Vogus (2003) revisited the idea of adaptability as a way to overcome adversity (see Meyer, 1982; Staw *et al.* 1981). The authors defined resilience as “positive adjustment under challenging conditions” (pg. 95), which includes adjustments to both ongoing strains due to small interruptions (referring to the reliability literature reviewed above) as well as severe disruptions due to exogenous events (referring to the literature on organizational responses to external threats, also reviewed above). Sutcliffe and Vogus (2003) attempted to combine insights from the two research streams and concluded that organizations are more likely to be resilient if enabling conditions are present (broader information processing, loosening of control, utilization of slack) as they create the continuing ability to use internal and external resources successfully to resolve issues. Hamel and Valikangas (2003) suggested innovation as another enabling condition as it allows organizations to constantly and continuously anticipate and adjust to a broad range of turbulence. In addition, Sutcliffe and Vogus (2003) revived the idea that resilience takes place at multiple (individual, group, organizational) levels (see Staw *et al.* 1981), but did not explore how the different levels interact, leaving this to future research.

Similar to Sutcliffe and Vogus (2003), Gittell *et al.* (2006) drew upon Meyer’s (1982) findings and made a case that organizations need a viable business model that allows financial reserves (or slack resources) to be built up, so that these resources can be used to provide a strong commitment to employees during the times of crises and sustain relationships that act as enabling conditions for organizations to quickly return to full performance. The authors investigated major airlines’ responses to 9/11 and found that the post-9/11 layoff (intended to improve economic performance) actually inhibited long-term business recovery. Taken together, the studies within this stream of literature propose the

creation of slack resources and other enabling conditions. However, a closer examination shows that they offer limited insights regarding the “optimal” configuration of resources and assets, and potential trade-offs between increasing resilience and avoiding inefficiencies (see Discussion).

***Resilient supply chain design:*** A third and separate stream of post-9/11 research has focused on resilient supply chain designs, with influential works outlined in Table 7. The 9/11 attacks revealed the inherent vulnerability of highly interdependent supply networks – such that effects of a disruption swiftly rippled through the economy. As noted by Rice and Caniato (2003: 22): “[T]he attacks dramatically illustrated the interdependence that exists in the supply network – not just among the trading partners but also with the U.S. government agencies involved in the flow of goods and the transportation infrastructure. This new operating environment calls for a supply network design that is both secure and resilient.”

-----  
Table 7 here  
-----

Most of the influential publications in this research stream are conceptual contributions, with the exception of Craighead *et al.* (2007) and Juettner and Maklan (2011). The key focus of the conceptual work rests on deriving theoretical insights into design principles that can promote resilience within supply chains. The principles most commonly hypothesized to lead to resilience in supply chains or networks are flexibility (in some studies referred to as mobility or agility) and redundancy (e.g., modular designs, diversification across suppliers, multiple transport or production modes) (Christopher and Peck 2004; Kleindorfer and Saad 2005; Klibi *et al.* 2010; Pettit *et al.* 2010; Rice and Caniato 2003; Sheffi 2005; Sheffi and Rice 2005). The impacts of implementing these design principles on both cost and service characteristics remain unclear, yet there is a common assumption that the ‘right’ configuration of a supply chain with carefully designed flexibility and redundancy

alternatives can bring significant collateral benefits to organizations (e.g., Rice and Caniato 2003; Sheffi 2005; Sheffi and Rice 2005).

Influential empirical contributions in this research stream are sparse and fragmented. Juettner and Maklan (2011) provided some case evidence regarding supply chain resilience in the global financial crisis, and concluded that four resilience capabilities (flexibility, velocity/reaction speed, access to timely information, and collaborations among supply chain members) can avoid or limit the impacts of adverse events on revenue, cost and lead time/availability targets. Craighead *et al.* (2007) investigated why some supply chain disruptions are more severe than others and concluded that the severity of supply chain disruptions is related to supply chain design characteristics of density, complexity, and node criticality. Due to the dearth of empirical studies, recent influential contributions (Pettit, Fiksel and Croxton 2010; Ponomarov and Holcomb 2009; Powley 2009) have developed models for future research to empirically test which capabilities lead to ‘better’ responses and more resilient supply chains. These models may also provide opportunities for researchers to look at resilience in a multi-level context (see Discussion).

### **New directions: Resilience activation**

Researchers began to comment that there were few avenues to detect whether or not an organization had ‘resilience potential’, prior to demonstrating a resilient or non-resilient response (Linnenluecke and Griffiths 2012). Furthermore, researchers argued that more attention should be devoted to the period of detecting a threat (i.e., realizing that an external threat or uncommon situation requires a resilient response) and activating a corresponding and possibly latent organizational response (Burnard and Bhamra 2011). In an attempt to fill this void, Powley (2009) (see Figure 2) studied a shooting at an American business school and concluded that resilience was activated and engaged through three mechanisms: (i) the alteration and emergence of relational structures among the university community (liminal

suspension), (ii) the extent to which community members were mindful of the needs of others (compassionate witnessing), and (iii) the availability of overlapping social and informational resources, both within and beyond the boundaries of the university community (relational redundancy). This line of research has not yet been fully developed, thus leaving opportunities for future research to study the detection and activation of resilience in organizations (see also Discussion).

-----  
Table 8 here  
-----

### **Emerging research trends among recently published papers**

The bibliographic mapping approach presented in this paper favors papers which have been reasonably well cited, and does not provide a full account of new research directions among papers that are new to the literature and have not yet attracted many citations. Nonetheless, a manual inspection of recent publications allows the identification of a number of important trends: First, researchers continue to be interested in understanding employee resilience and psychological capital development. New studies in this area include further research on psychological capital development in different cultural contexts (e.g., Dollwet and Reichard 2014; Reichard *et al.* 2014; Wang *et al.* 2014) and organizational settings such as family firms and high reliability organizations (e.g., Bergheim *et al.* 2013; Memili *et al.* 2013). In addition, researchers have extended their investigation into the impact of psychological capital development on factors such as employees' attitudes, performance and behaviors, including leadership behaviors and behaviors towards organizational change (e.g., Avey *et al.* 2011; Luthans *et al.* 2013; Shin *et al.* 2012).

Second, researchers also continue to be interested in the topic of supply chain resilience and have – to some extent – attempted to address the dearth of empirical studies on

this topic. Recent studies provide further insights into how factors including the management of intra-firm relationships through inventory management, information sharing and connectivity influence resilience (e.g., Boone *et al.* 2013; Brandon-Jones *et al.* 2014; Wieland and Wallenburg, 2013). Researchers have also started to focus on the role of public-private partnerships as well as stakeholder, community and institutional support in building organizational resilience (e.g., Chen *et al.* 2013; Johnston *et al.* 2012; Voss *et al.* 2013; Xavier *et al.* 2014), arguing for a link between public sector support and community engagement in supporting both community and business resilience.

Third, researchers have started to pay increased attention towards global security concerns and the resilience of organizations and supply chains to terrorist attacks (e.g., Urciuoli *et al.* 2014; Voss *et al.* 2013), as well as climate change and trend changes in weather extremes (e.g., Linnenluecke and Griffiths 2013; Wedawatta and Ingirige 2012; Winn and Pogutz 2013; Winston 2014). This research comments on the significant risks that organizations are exposed to from environmental instability and analyses ways in which organizations can create resilience to these risks. Related papers focus in particular on how organizations can manage and reduce interdependencies within highly complex and vulnerable systems (e.g., supply networks), as well as avoid destroying the life-supporting foundations provided by ecosystem stability. In addition, some literature has started to analyze the role of entrepreneurship and enterprise resilience in developing regions affected by war and terrorism, allowing individuals to (re)engage in economic activity in unstable conflict settings (Bullough *et al.* 2014; Branzei *et al.* 2010).

## **DISCUSSION AND DIRECTIONS FOR FUTURE RESEARCH**

Findings from the review show that resilience research is fragmented across several research streams. One possible reason for this fragmentation is that resilience research has often been motivated by a particular set of circumstances. For instance, resilience research

from the 1980s onwards was focused on detecting and attributing the causes of the large-scale accidents and disasters of the time. The corresponding literature emphasized operational safety and reliability, and tried to determine the successful practices of those organizations that had been highly reliable over time. Post-9/11 enquires shifted to researching coping mechanisms and responses to external threats and conditions of great uncertainty. The corresponding literature concentrated on building resilience through employee strengths, adaptable business models, and better supply chain design. To some extent, the different research streams can be regarded as empirical and conceptual attempts to make sense of events in a given period to generate new insights into how organizations (should) deal with adversity under a particular set of circumstances. It is likely that more recent events and developments (e.g., the financial crisis, concerns about climate change) will have an impact on the resilience literature going forward. In addition, it is likely to see future studies on the causes and consequences of major recent catastrophes and disasters.

Research thus far has produced a great wealth of knowledge on resilience across different research streams. Reviewing these streams reveals three key findings: First, resilience has been conceptualized quite differently across studies, meaning that the different research streams have developed their own definitions, theories and understandings of resilience. Second, conceptual similarities and differences among these streams have not yet been explored, nor have insights been gleaned into any possible generalizable principles for developing resilience. Third, resilience has been operationalized quite differently, with few insights into the empirics for detecting resilience to future adversity (or the absence thereof). Some exchanges have taken place at the intersections of the different research streams; however, neither the limitations of the current body of knowledge nor the opportunities for cross-fertilization among different research streams (or even among different disciplines, such as ecology or engineering) have been fully explored. The section above has already

outlined emerging research trends among recently published papers. In addition, the following sections outline pathways for future research, highlighting opportunities to integrate and expand on existing knowledge, as well as avenues for further investigating resilience in business and management studies. These avenues of future enquiry, summarized in Table 9, are set out to form a research agenda for improving our understanding of resilience, especially across different levels of analysis.

-----  
Table 9 here  
-----

### **The context of resilience**

A first conclusion from examining the knowledge development on resilience is that resilience research has been highly context-dependent. One prominent approach for assessing resilience has been case-based research on organizational responses in the context of accidents and disasters. These studies usually diagnose what happened (or ‘how resilient’ the organization was) in a certain situation, and seek to derive insights into how future resilience may be improved, based on a generalization from these insights. Beyond these studies, resilience has been researched in contexts such as organizational behavior or supply chain design. These studies illustrate important context-related points, but they do not draw out the context-dependency of their insights, and little is known about the transferability of insights across different contexts. Future research could investigate if and how findings from discrete case examples could be integrated to develop insights that are more generalizable to different settings and contexts (including under-researched contexts such as organizations in developing countries and conflict settings, see Bullough *et al.* 2014; Branzei *et al.* 2010). It may be possible that several theoretical streams become part of a pluralistic debate on resilience, recognizing that no single publication on the topic provides the ultimate answer for creating resilience in organizations.



The context-dependent nature of research across different study contexts has also led to highly fragmented conceptualizations of resilience. For example, Meyer (1982) was initially interested in organizational responses (or organizational adaptability) to an environmental jolt, and thus he conceptualized resilience as an outcome variable, defined as the time needed for the organizations in his study to restore normal levels of operations. Contributions that followed focused on organizational processes precluding failures and malfunctioning from happening (e.g., mindful processes in the context of high reliability organizing, see Weick *et al.* 1999). Other contributions considered developmental aspects related to identifying and managing employee strengths (Coutu 2002; Luthans 2002b), adapting business models (Hamel and Valikangas 2003), or implementing design characteristics for fostering resilience, such as flexibility and redundancy.

It appears that resilience has been conceptualized in several different ways, depending on context. For example, some studies view resilience as a way of *positively engaging* with internal failures, weaknesses, deviations or impacts as they become apparent (mindful organizing, non-rigid information processing, experimentation, learning from adversity or small losses, human resources training). Other studies suggest that resilience is a way of *avoiding* (resisting, or buffering against) external impacts by implementing design principles (redundancy, flexibility, reinvention). Some conceptualizations emphasize that resilience involves *recovering from* extreme events and disasters (learning, ‘bouncing back’), possibly even in a strengthened or improved fashion. Other studies have conceptualized resilience as an *outcome* of recovery attempts and learning (as evidenced by the restoration of organizational functions). A question that arises is whether these are complementary or competing, or simply context-dependent ‘approaches’ to building resilience.

To date, researchers have neither unified nor resolved whether and how different conceptualizations and approaches (e.g., high reliability organizing, learning from failure,

experimentation, building employee strengths) are relevant in different contexts. Some researchers have, for instance, questioned whether the principles of high reliability organizing can readily be copied from one type of challenge and one type of organization to another (Boin & Hart 2010). While some publications import definitions from other research streams (see Tables 3 to 8 for details), they often assume (rather than test) their applicability in a different context. Future research may be able to assist in understanding the context-dependency of resilience. Interesting questions for further research (see Table 9) could include: What type of resilience approach is most beneficial to firms, and under what conditions/in which context(s)? Is resilience specific to a certain situation (e.g., a certain threat/crisis or type of volatile environment), or are there resources, capabilities and organizational structures that promote resilience in a wide variety of different contexts? Future research could revisit our current understanding of resilience and its applicability in different situations, by more carefully studying and comparing the conceptualization of resilience in different contexts. Studies have also not yet explicitly focused on differences or similarities across public and private sector/not-for-profit organizations.

It should be noted that many studies have simply assumed that their observations of organizational phenomena explain the concept of resilience, despite being conducted in vastly different contextual settings. In other words, many studies on resilience have been driven by the a priori assumption that discernible ‘resilience features’ must have existed within the organization(s) under study. However, research has not yet explicitly established how resilience is delimited from related concepts (agility, safety, stability). Furthermore, research has not asked whether many organizations already use resources and capabilities to build resilience against a range of possible risks – with outcomes that are ‘invisible’ because these resilient organizations do not experience any disruptions, deviations or crises. Consequently, future research could focus on strengthening the validity of the concept.

## **Organizing for resilience**

A second conclusion from this analysis is that studies on resilience often propose particular ways of arranging or accumulating assets and resources (including human resources) to create resilience. Meyer (1982), for instance, suggested that slack (i.e., ‘redundant’) resources were important in absorbing the impacts of adverse conditions (in this case, a strike). With reference to Meyer (1982), Gittell *et al.* (2006) also emphasized the importance of slack resources (financial reserves and viable business models) to help preserve relational reserves over time. Similarly, studies on resilient supply chains have called for slack resources (diversity, redundancy). However, it has not yet been fully explored whether certain resources, capabilities (including employee strengths) or organizational structures really promote resilience (or simply introduce additional costs, for example due to employee training), and if so, to what extent they promote resilience and how they need to be configured to achieve optimal outcomes.

The literature offers at times contradictory recommendations for how organizations should build resilience. Tensions between the need for organizational stability on the one hand (habits, routines, consistency, control, and low deviation) and organizational change on the other hand (search, mindfulness, redundancy, openness, preoccupation with failure, imagination, experimentation and variety) have not yet been resolved and require future work (see also Farjoun 2010). A similar issue arises with desired outcomes such as organizational reliability on the one hand, and innovation, adaptability, and flexibility on the other. Future research could explore the extent to which organizations should, or need to, “tinker” to find the right responses to environmental change, or to what extent organizations can rely on pre-defined recommendations for building resilience (see also Taleb, 2011).

Furthermore, not only the tensions, but also the conceptual similarities between what seem to be diverse areas of research require further work. For instance, Staw *et al.* (1981)

hypothesized that negatively framed situations can foster risk avoidance in the form of threat-rigidity responses (i.e., aggregate individuals' framing of events can lead to negative outcomes on an organizational level). Later work on employee strengths by Luthans and colleagues developed similar themes by drawing upon conceptual foundations from psychology (Bandura 1997; Seligman 1998) that are concerned with information processing and individuals' framing of events. These authors propose that individuals who frame situations negatively may have negative effects on their personal motivation, personal success and their ability to influence the turn of events. Future theory development could combine these insights across research streams to consider how organizational processes of framing interact with core leadership or motivation concepts. Such an approach could provide insights on how adversity is (or can be) perceived and how this affects organizational responses.

### **Measuring resilience**

A third conclusion from the analysis is that existing attempts to detect resilience (or absence thereof) have not only conceptualized, but operationalized, the concept quite differently. Studies have largely employed retrospective analyses to diagnose 'how resilient' an organization (or its systems or employees) was in a certain situation or at a certain point in time, and how these insights can improve organizational resilience in the future. However, research is yet to identify the predictive factors that promote organizational resilience to future conditions.

One issue to consider is that existing theoretical and empirical insights may have not yet uncovered the full range of factors leading to resilience, and that existing insights might not be directly applicable or transferable to different or future contexts. When studies use existing insights to define a priori variables leading to organizational resilience, their resulting conclusions are largely driven by the initial selection of variables (Cumming *et al.* 2005). Another issue is whether resilience is a quality that is readily observable through

empirical research (and possibly even open to managerial intervention, as suggested by the resilience literature on employee strengths), or whether resilience only becomes visible (or activated) under a particular set of trying or exceptional circumstances which cannot be easily replicated for the purposes of administering surveys or experiments. However, a lack of resilience may also only become visible once a certain threshold is exceeded beyond which the organization can no longer cope with adversity (Rudolph and Reppenning, 2002).

Part of the problem in drawing out the resilience of organizations to future conditions is that there is a range of potentially relevant variables that could influence resilience. The resilience of an organization to a particular event may well be related to its relative size; the disruption of operations in a local branch may seem minor from the perspective of a large, global organization, but can be significant for a small organization which operates only in few locations (Linnenluecke and Griffiths 2010). Future research could focus on developing more detailed approaches for assessing resilience, not only for research purposes, but also for practitioners, including managers and policy-makers. Practical insights are needed regarding how organizations can activate resilience, and the specific resources, structures and processes they need to respond to different types of events, including organizationally-based impacts (crises, accidents) and external impacts, such as terrorism attacks or natural disasters.

### **Resilience in a multi-level context**

Future research may also focus on multi-level issues and on the question of scale. The existing resilience literature has recognized that resilience in organizations can be brought about by factors on various levels; for instance, the individual employee level or the organizational level (e.g., Sutcliffe and Vogus 2003). However, there are currently few insights into how these different levels of analysis are linked to each other and how resilience can potentially be “scaled up”. Research on resilience increasingly regards organizations as embedded in institutional contexts (e.g., Xavier *et al.* 2014) and highly interconnected

supply- and inter-organizational structures which determine their resilience and vulnerability to adverse impacts (e.g., Craighead *et al.* 2007; Urciuoli *et al.* 2014; Voss *et al.* 2013). This literature already suggests that resilience is often not just determined by organizational resources and capabilities alone, but by the interrelations and interactions that organizations have with other actors, for instance, along the supply chain. Critical failures in the supply network can lead to unintended consequences, for instance through supply shortages. An important avenue for future research is therefore how inter-organizational structures should be designed for resilience, recognizing that organizations are not entities operating in isolation.

Studies mapping interdependencies of organizations and their environment (e.g., resources or knowledge flows) are likely to become increasingly important given our fast-paced business environment. However, there are few studies empirically investigating such interdependencies. For example, few studies empirically investigate supply chain disruptions and resilience (see Klibi *et al.* 2010). This may be because of the diversity of supply chains and networks, as well as the number of actors involved. These factors make it difficult to capture the complexity of interactions and trade-offs between flexibility and/or redundancies (to increase resilience) and costs and service characteristics along the entire supply chain. Research has also not yet fully explored the design characteristics and capabilities that make supply chains (or other inter-organizational connections, such as critical infrastructure linkages) resilient. In particular, there are still few multi-actor and longitudinal field studies (see Johnson and Elliott 2011 for an exception) tracking a supply chain disruption as it unfolds over time and affects various actors along the supply chain.

In addition, there are few insights into factors that promote organizational resilience beyond the organizational level of analysis. Such factors might be at the industry, policy, or even broader societal level. For instance, when an adverse event such as a natural disaster

occurs, organizational resilience is often subsidized by importing resources from the state or from another region (Carpenter *et al.* 2001; Zoback, 2014). This opens up opportunities to integrate findings and insights from other disciplines. For example, how is the resilience of engineered systems (e.g., critical infrastructures), socio-political systems or ecosystems related to organizational resilience? If structures and processes at a larger scale are not resilient against adverse impacts, this can have major consequences for organizations. For instance, the failure of critical infrastructure after a hurricane may result in cascading or escalating disruptions such that the impacts can be felt by organizations that were not directly impacted (Rinaldi *et al.* 2001). Future research could adopt multi-level and multi-disciplinary perspectives on the concept of organizational resilience.

## **CONCLUSION**

The review and the suggestions for future research are intended to be the basis for theoretical and empirical development of the resilience concept. Many organizations will find themselves unprepared for the impacts of adverse events, unless they build suitable capacities and appropriate decision-making knowledge on how resilience is defined, by which variables it is determined, and how it can be assessed, maintained, and improved over time.

## REFERENCES

- Allen, D. E. and Powell, R. (2013). The fluctuating default risk of Australian banks. *Australian Journal of Management*, **37**(5), 297-325.
- Allenby, B. and Fink, J. (2005). Toward inherently secure and resilient societies. *Science*, **309**, pp. 1034-1036.
- Avey, J. B., Luthans, F. and Jensen, S. M. (2009). Psychological capital: A positive resource for combating employee stress and turnover. *Human Resource Management*, **48**(5), pp. 677-693.
- Avey, J. B., Reichard, R. J., Luthans, F. and Mhatre, K. H. (2011). Meta-analysis of the impact of positive psychological capital on employee attitudes, behaviors, and performance. *Human Resource Development Quarterly*, **22**(2), pp. 127-152.
- Avey, J. B., Wernsing, T. S. and Luthans, F. (2008). Can positive employees help positive organizational change? Impact of psychological capital and emotions on relevant attitudes and behaviors. *Journal of Applied Behavioral Science*, **44**(1), pp. 48-70.
- Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. New York: Freeman.
- Bergheim, K., Eid, J., Hystad, S. W., Nielsen, M. B., Mearns, K., Larsson, G. and Luthans, B. (2013). The role of psychological capital in perception of safety climate among air traffic controllers. *Journal of Leadership & Organizational Studies*, **20**(2), pp. 232-241.
- Block, J. and Kremen, A. M. (1996). IQ and ego-resiliency: Conceptual and empirical connections and separateness. *Journal of Personality and Social Psychology*, **70**(2), 349-361.
- Boin, A. and Hart, P. (2010). Organizing for effective emergency management: Lessons from research. *Australian Journal of Public Administration*, **69**, pp. 357-371.
- Boone, C. A., Craighead, C. W., Hanna, J. B. and Nair, A. (2013). Implementation of a system approach for enhanced supply chain continuity and resiliency: A longitudinal study. *Journal of Business Logistics*, **34**(3), pp. 222-235.
- Börner, K., Chen, C. and Boyack, K. (2003). Visualizing knowledge domains. *Annual Review of Information Science and Technology*, **37**, pp. 179-255.
- Brandon-Jones, E., Squire, B., Autry, C. W. and Petersen, K. J. (2014). A contingent resource-based perspective of supply chain resilience and robustness. *Journal of Supply Chain Management*, **50**(3), pp. 55-73.
- Branzei, O. and Abdelnour, S. (2010). Another day, another dollar: Enterprise resilience under terrorism in developing countries. *Journal of International Business Studies*, **41**(5), pp. 804-825.
- Brown, A. G. (1993). High reliability organizations: A review and critique of the Berkeley group. Templeton Management Research Paper MRP/93/9, 1993.



- Bullough, A., Renko, M. and Myatt, T. (2014). Danger zone entrepreneurs: The importance of resilience and self-efficacy for entrepreneurial intentions. *Entrepreneurship Theory and Practice*, **38**(3), pp. 473-499.
- Burnard, K. and Bhamra, R. (2011). Organizational resilience: Development of a conceptual framework for organizational responses. *International Journal of Production Research*, **49**(18), pp. 5581-5599.
- Cameron, K. S., Dutton, J. E. and Quinn, R. E. (Eds.). (2003). *Positive organizational scholarship: Foundations of a new discipline*. San Francisco: Berrett-Koehler.
- Campbell, D. T. (1965). Variation and selective retention in socio-cultural evolution. In H. R. Barringer, G. I. Blanksten, and R. Mack (Eds.), *Social Change in Developing Areas*. Cambridge, MA: Schenkman.
- Campbell, D. T. (1965). Variation and selective retention in socio-cultural evolution. *General Systems*, 14, pp. 69-85.
- Carpenter, S., Walker, B., Anderies, J. M. and Abel, N. (2001). From metaphor to measurement: Resilience of what to what? *Ecosystems*, **4**(8), pp. 765-781.
- Chen, J., Chen, T. H. Y., Vertinsky, I., Yumagulova, L. and Park, C. (2013). Public-private partnerships for the development of disaster resilient communities. *Journal of Contingencies and Crisis Management*, **21**(3), pp. 130-143.
- Christopher, M. and Peck, H. (2004). Building the resilient supply chain. *International Journal of Logistics Management*, **15**(2), pp. 1-14.
- Coutu, D. L. (2002). How resilience works. *Harvard Business Review*, **80**, pp. 46-55.
- Craighead, C. W., Blackhurst, J., Rungtusanatham, M. J. and Handfield, R. B. (2007). The severity of supply chain disruptions: Design characteristics and mitigation capabilities. *Decision Sciences*, **38**(1), pp. 131-156.
- Davies, A. and Thomas, R. (2003). Talking cop: discourses of change and policing identities. *Public Administration*, **81**(4), pp. 681-699.
- Dollwet, M. and Reichard, R. (2014). Assessing cross-cultural skills: Validation of a new measure of cross-cultural psychological capital. *The International Journal of Human Resource Management*, **25**(12), pp. 1669-1696.
- Dongsheng Z, Weijiong Z, and Vertinsky I. (2002). Advertising trends in urban china. *Journal of Advertising Research*, **42**(3): 73-81.
- Farjoun, M. (2010). Beyond dualism: Stability and change as a duality. *Academy of Management Review*, **35**(2), pp. 202-225.
- Farjoun, M. and Starbuck, W. H. (2007). Organizing at and beyond the limits. *Organization Studies*, **28**(4), pp. 541-566.
- Fiksel, J., Polyviou, M., Croxton, K. L. and Pettit, T. J. (2015). From risk to resilience: Learning to deal with disruption. *MIT Sloan Management Review*, 56(2), pp. 79-86.

- Garfield, E. (2004). Historiographic mapping of knowledge domains literature. *Journal of Information Science*, **30**(2), pp. 119-145.
- Gittell, J. H., Cameron, K., Lim, S. and Rivas, V. (2006). Relationships, layoffs, and organizational resilience: Airline industry responses to September 11. *Journal of Applied Behavioral Science*, **42**(3), pp. 300-329.
- Hamel, G. and Valikangas, L. (2003). The quest for resilience. *Harvard Business Review*, **81**(9), pp. 52-65.
- Hiles, A. (2008). *The Definitive Handbook of Business Continuity Management*. 2nd ed. Chichester, UK: John Wiley & Sons.
- Hopkins, A. (1999). The limits of normal accident theory, *Safety Science*, **32**(2), pp. 93-102.
- Janssen, M. A. (2007). An update on the scholarly networks on resilience, vulnerability, and adaptation within the human dimensions of global environmental change. *Ecology and Society*, **12**(2), pp. 9-27.
- Janssen, M. A., Schoon, M. L., Ke, W. and Börner, K. (2006). Scholarly networks on resilience, vulnerability and adaptation within the human dimensions of global environmental change. *Global Environmental Change*, **16**(3), pp. 240-252.
- Johnson, N. and Elliott, D. Using social capital to organize for success? A case study of public-private interface in the UK Highways Agency. *Policy and Society*, **30**(2), pp. 101-113.
- Johnston, D., Becker, J. and Paton, D. (2012). Multi-agency community engagement during disaster recovery: Lessons from two New Zealand earthquake events. *Disaster Prevention and Management: An International Journal*, **21**(2), pp. 252-268.
- Juettner, U. and Maklan, S. (2011) Supply chain resilience in the global financial crisis: An empirical study. *Supply Chain Management: An International Journal*, **16**(4), pp. 246-259.
- Kambhu, J., Weidman, S. and Krishnan, N. (2007). New directions for understanding systemic risk: A report on a conference cosponsored by the Federal Reserve Bank of New York and the National Academy of Sciences. *Economic Policy Review*, **13**(2), pp. 1-83.
- Klein, R. J. T., Nicholls, R. J. and Thomalla, F. (2003). Resilience to natural hazards: How useful is this concept? *Global Environmental Change*, **5**, pp. 35-45.
- Kleindorfer, P. R. and Saad, G. H. (2005). Managing disruption risks in supply chains. *Production and Operations Management*, **14**(1), pp. 53-68.
- Klibi, W., Martel, A. and Guitouni, A. (2010). The design of robust value-creating supply chain networks: a critical review. *European Journal of Operational Research*, **203**(2), 283-293.

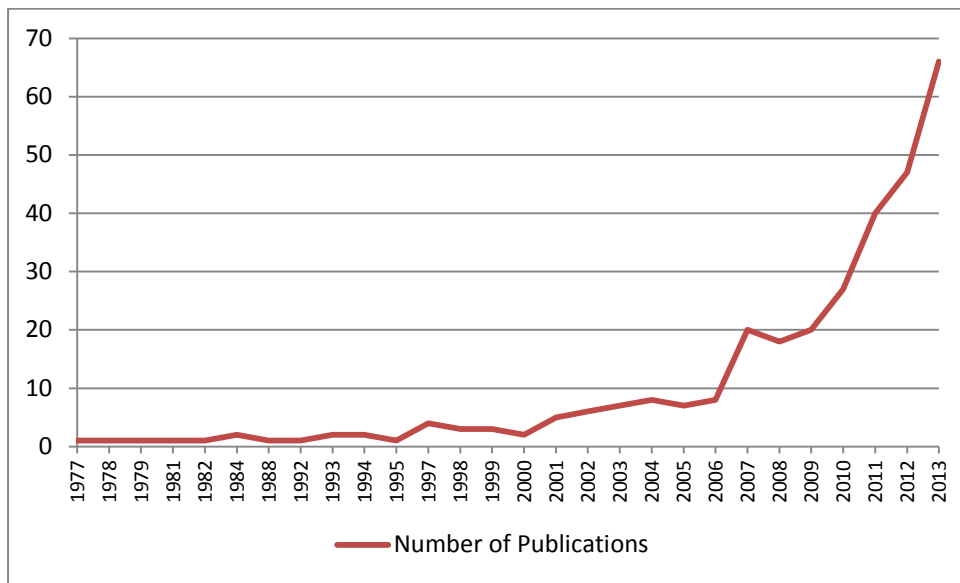
- Limnios, E. A. M., Mazzarol, T., Ghadouani, A. and Schilizzi, S. G. (2014). The resilience architecture framework: Four organizational archetypes. *European Management Journal*, **32**(1), 104-116.
- Linnenluecke, M. and Griffiths, A. (2010). Beyond adaptation: resilience for business in light of climate change and weather extremes. *Business & Society*, **49**(3), pp. 477.
- Linnenluecke, M. K. and Griffiths, A. (2012). Assessing organizational resilience to climate and weather extremes: complexities and methodological pathways. *Climatic Change*, **113**(3-4), pp. 933-947.
- Linnenluecke, M. K. and Griffiths, A. (2013). The 2009 Victorian Bushfires: A Multilevel Perspective on Organizational Risk and Resilience. *Organization & Environment*, Online First.
- Luthans, B. C., Luthans, K. W. and Avey, J. B. (2013). Building the leaders of tomorrow: The development of academic psychological capital. *Journal of Leadership & Organizational Studies*, Online First.
- Luthans, F. (2002a). Positive organizational behavior: Developing and managing psychological strengths. *Academy of Management Executive*, **16**(1), pp. 57-72.
- Luthans, F. (2002b). The need for and meaning of positive organizational behavior. *Journal of Organizational Behavior*, **23**(6), pp. 695-706.
- Luthans, F. and Youssef, C. M. (2007). Emerging positive organizational behavior. *Journal of Management*, **33**(3), pp. 321-349.
- Luthans, F., Avey, J. B. and Patera, J. L. (2008). Experimental analysis of a web-based training intervention to develop positive psychological capital. *Academy of Management Learning & Education*, **7**(2), pp. 209-221.
- Luthans, F., Avey, J. B., Avolio, B. J. and Peterson, S. J. (2010). The development and resulting performance impact of positive psychological capital. *Human Resource Development Quarterly*, **21**(1), pp. 41-67.
- Luthans, F., Avey, J. B., Avolio, B. J., Norman, S. M. and Combs, G. M. (2006). Psychological capital development: Toward a micro-intervention. *Journal of Organizational Behavior*, **27**(3), pp. 387-393.
- Luthans, F., Avolio, B. J., Avey, J. B. and Norman, S. M. (2007). Positive psychological capital: Measurement and relationship with performance and satisfaction. *Personnel Psychology*, **60**(3), 541-572.
- Manyena, S. B. (2006). The concept of resilience revisited. *Disasters*, **30**, pp. 433-450.
- Memili, E., Welsh, D. H. and Luthans, F. (2013). Going beyond research on goal setting: A proposed role for organizational psychological capital of family firms. *Entrepreneurship Theory and Practice*, **37**(6), pp. 1289-1296.
- Meyer, A. D. (1982). Adapting to environmental jolts. *Administrative Science Quarterly*, **27**, pp. 515-537.

- Pearson, C. M. and Clair, J. A. (1998). Reframing crisis management. *Academy of Management Review*, **23**(1), pp. 59-76.
- Perrow, C. (1984). *Normal accidents: Living with high-risk technologies*. New York: Basic Books.
- Pettit, T. J., Fiksel, J. and Croxton, K. L. (2010). Ensuring supply chain resilience: development of a conceptual framework. *Journal of Business Logistics*, **31**(1), pp. 1-21.
- Ponomarov, S. Y. and Holcomb, M. C. (2009). Understanding the concept of supply chain resilience. *International Journal of Logistics Management*, **20**(1), pp. 124-143.
- Powley, E. H. (2009). Reclaiming resilience and safety: Resilience activation in the critical period of crisis. *Human Relations*, **62**(9), pp. 1289-1326.
- Reichard, R. J., Dollwet, M. and Louw-Potgieter, J. (2014). Development of cross-cultural psychological capital and its relationship with cultural intelligence and ethnocentrism. *Journal of Leadership & Organizational Studies*, **21**(2), pp. 150-164.
- Rice, J. B. and Caniato, F. (2003). Building a Secure and Resilient Supply Network. *Supply Chain Management Review*, **7**(5), pp. 22-30.
- Rinaldi, S. M., Peerenboom, J. P. and Kelly, T. K. (2001). Identifying, understanding, and analyzing critical infrastructure interdependencies. *IEEE Control Systems Magazine*, **21**, pp. 11-25.
- Rochlin, G. I. (1999). Safe operation as a social construct. *Ergonomics*, **42**(11), pp. 1549-1560.
- Rudolph, J. W. and Repenning, N. P. (2002). Disaster dynamics: Understanding the role of quantity in organizational collapse. *Administrative Science Quarterly*, **47**(1), pp. 1-30.
- Seligman, M. (1998). *Learned Optimism: How to Change Your Mind and Your Life*. New York: Pocket Books.
- Sheffi, Y. (2005). *The Resilient Enterprise: Overcoming Vulnerability for Competitive Advantage*. MIT Press Books.
- Sheffi, Y. and Rice, J. (2005). A supply chain view of the resilient enterprise. *MIT Sloan Management Review*, **47**(1), pp. 41-48.
- Shin, J., Taylor, M. S. and Seo, M. G. (2012). Resources for change: The relationships of organizational inducements and psychological resilience to employees' attitudes and behaviors toward organizational change. *Academy of Management Journal*, **55**(3), pp. 727-748.
- Shrivastava, P. (1994). Technological and organizational roots of industrial crises: Lessons from Exxon Valdez and Bhopal. *Technological Forecasting and Social Change*, **45**(3), 237-253.

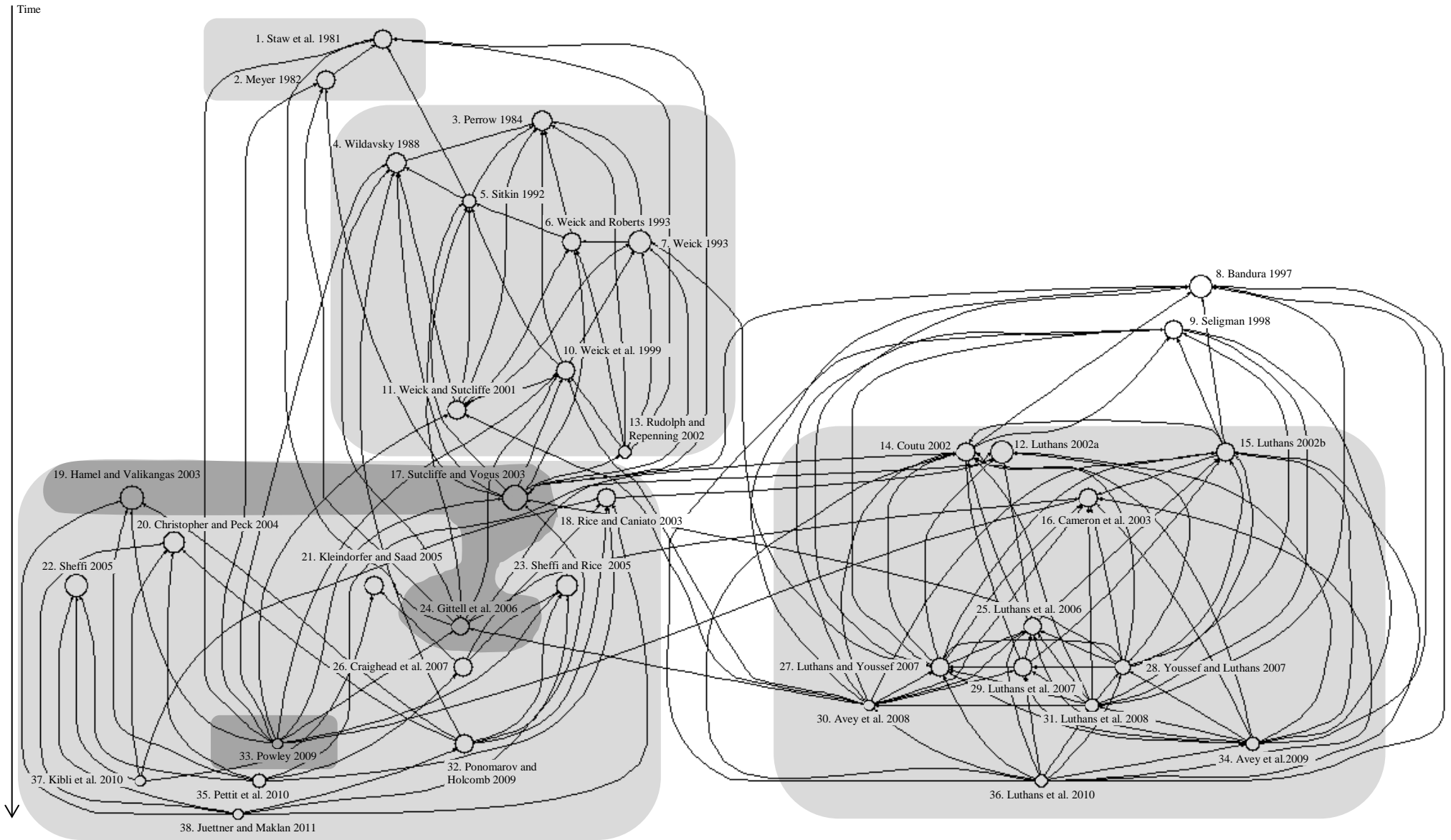
- Shrivastava, P. (1995). Ecocentric management for a risk society. *Academy of Management Review*, **20**(1): 118-137.
- Sitkin, S. B. (1992). Learning through failure: The strategy of small losses. *Research in Organizational Behavior*, **14**, pp. 231-266.
- Smart, P. K., Tranfield, D., Deasley, P., Levene, R., Rowe, A. and Corley, J. (2003). Integrating 'lean' and 'high reliability' thinking. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, **217**(5), pp. 733-739.
- Smith, D. and Elliott, D. (Eds.). (2006). *Key Readings in Crisis Management: Systems and Structures for Prevention and Recovery*. London: Routledge.
- Staw, B. M., Sandelands, L. E. and Dutton, J. E. (1981). Threat rigidity effects in organizational behavior: A multilevel analysis. *Administrative Science Quarterly*, **26**(4), pp. 501-524.
- Sutcliffe, K. M. (2011). High reliability organizations (HROs). *Clinical Anaesthesiology*, **25**(2), pp. 133-144.
- Sutcliffe, K. M. and Vogus, T. J. (2003). Organizing for resilience. In K. S. Cameron, J. E. Dutton and R. E. Quinn (Eds.), *Positive organizational scholarship: Foundations of a new discipline*. Berrett-Koehler.
- Taleb, N. N. (2011). Antifragility - or - The property of disorder-loving systems. Available online: [http://www.edge.org/q2011/q11\\_3.html#taleb](http://www.edge.org/q2011/q11_3.html#taleb). Accessed on 31 August 2014.
- Urciuoli, L., Mohanty, S., Hintsa, J. and Gerine Boekesteijn, E. (2014). The resilience of energy supply chains: A multiple case study approach on oil and gas supply chains to Europe. *Supply Chain Management: An International Journal*, **19**(1), pp. 46-63.
- Van Eck, N. J. and Waltman, L. (2014). Visualizing bibliometric networks. In Y. Ding, R. Rousseau, and D. Wolfram (Eds.), *Measuring Scholarly Impact*. Cham, Switzerland: Springer.
- Van Den Eede, G., Van de Walle, B. and Rutkowski, A. (2006). Dealing with risk in incident management: An application of high reliability theory. In HICSS'06 2006. *Proceedings of the 39th Annual Hawaii International Conference on System Sciences* (Vol. 2, pp. 37c-37c).
- Vogus, T. J. and Sutcliffe, K. M. (2007). *Organizational resilience: Towards a theory and research agenda*. Paper presented at the IEEE International Conference on Systems, Man and Cybernetics.
- Voss, M. D. and Williams, Z. (2013). Public-private partnerships and supply chain security: C-TPAT as an indicator of relational security. *Journal of Business Logistics*, **34**(4), pp. 320-334.
- Wagnild, G. M. and Young, H. M. (1992). Development and psychometric evaluation of the Resilience Scale. *Journal of Nursing Measurement*, **1**(2), pp. 165-178.

- Wang, J., Cooke, F. L. and Huang, W. (2014). How resilient is the (future) workforce in China? A study of the banking sector and implications for human resource development. *Asia Pacific Journal of Human Resources*, **52**(2), pp. 132-154.
- Wedawatta, G. and Ingirige, B. (2012). Resilience and adaptation of small and medium-sized enterprises to flood risk. *Disaster Prevention and Management: An International Journal*, **21**(4), pp. 474-488.
- Weick, K. E. (1993). The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative Science Quarterly*, **38**, pp. 628-652.
- Weick, K. E. and Roberts, K. H. (1993). Collective mind in organizations: Heedful interrelating on flight decks. *Administrative Science Quarterly*, **38**, pp. 357-381.
- Weick, K. E. and Sutcliffe, K. M. (2001). *Managing the unexpected*. San Francisco: Jossey-Bass.
- Weick, K. E., Sutcliffe, K. M. and Obstfeld, D. (1999). Organizing for high reliability: Processes of collective mindfulness, *Research in Organizational Behavior*, **21**, pp. 81-124.
- Wieland, A. and Wallenburg, M. C. (2013). The influence of relational competencies on supply chain resilience: a relational view. *International Journal of Physical Distribution & Logistics Management*, **43**(4), pp. 300-320.
- Wildavsky, A. B. (1988). *Searching for safety*. New Jersey: Transaction Publishers.
- Winn, M. I. and Pogutz, S. (2013). Business, ecosystems, and biodiversity: New horizons for management research. *Organization & Environment*, Online First.
- Winston, A. (2014). Resilience in a hotter world. *Harvard Business Review*, **92**(4), 56-64.
- Xavier, W. G., Bandeira-de-Mello, R. and Marcon, R. (2014). Institutional environment and Business Groups' resilience in Brazil. *Journal of Business Research*, **67**(5), 900-907.
- Youssef, C. M. and Luthans, F. (2007). Positive organizational behavior in the workplace The impact of hope, optimism, and resilience. *Journal of Management*, **33**(5), pp. 774-800.
- Zoback, M. L. (2014). "Epicenters" of resilience. *Science*, **346**(6207), 283-283.

**Figure 1: Publications on resilience in the business and management field (per year)**



**Figure 2: Citation Network**



**Note:** The papers are displayed as nodes and along a timeline; older publications are displayed at the top of the network while newer papers are displayed at the bottom. Articles are numbered in chronological order - please see Table 2 for the corresponding full citation details of each paper. Different streams of research are surrounded by grey shading for greater visual clarity.



**Table 1: Manual additions to the dataset**

<b>Author(s)</b>	<b>Year</b>	<b>Publication Details</b>	<b>LCS</b>	<b>GCS</b>	<b>Reason for Manual Adding</b>
Staw <i>et al.</i>	1981	Administrative Science Quarterly	17	985	The publication does not refer to 'resilience' but addresses aspects of responses to threat which formed the basis for future work on resilience
Meyer	1982	Administrative Science Quarterly	16	464	The publication was not captured in the initial search as it does not refer to 'resilience' in the title, abstract or keywords
Perrow	1984	Normal Accidents	19	406	Book (not indexed)
Wildavsky	1988	Searching for Safety	19	286	Book (not indexed)
Weick and Roberts	1993	Collective Mind in Organizations: Heedful Interrelating on Flight Decks	17	1064	The publication does not refer to 'resilience' but addresses aspects of reliability which formed the basis for future work on resilience
Bandura	1997	Self-Efficacy: The Exercise of Control	24	9230	Book (not indexed)
Seligman	1998	Learned Optimism	18	140	Book (not indexed)
Weick <i>et al.</i>	1999	Organizing For High Reliability: Processes Of Collective Mindfulness (in Res Organ Behav)	15	385	Book Chapter (not indexed)
Weick and Sutcliffe	2001	Managing the Unexpected	17	650	Book (not indexed)
Luthans	2002a	Academy of Management Executive	17	187	Not captured in initial search
Sutcliffe and Vogus	2003	Organizing for Resilience (in Positive Org Scholar)	28	118	Book Chapter (not indexed)
Cameron <i>et al.</i>	2003	Positive organizational scholarship: Foundations of a new discipline	18	328	Edited Book (not indexed)
Rice and Caniato	2003	Supply Chain Management Review	15	129	Not captured in initial search
Christopher and Peck	2004	International Journal of Logistics Management	20	150	Not captured in initial search
Sheffi	2005	Resilient Enterprise	22	220	Book (not indexed)
Kleindorfer and Saad	2005	Production and Operations Management	18	283	Not captured in initial search
Gittell <i>et al.</i>	2006	Journal of Applied Behavioral Sciences	14	40	Not captured in initial search

Sorted by year in ascending order. The Local Citation Score (LCS) refers to the count of citations to each publication within the collection, while the Global Citation Score (GSC) refers to the count of citations to each publication within the *Web of Science*<sup>TM</sup>.

**Table 2: List with highly cited papers in the paper citation network**

<b>No.</b>	<b>Author(s) and Year</b>	<b>Journal/Publication Details</b>	<b>LCS</b>	<b>GCS</b>
1	Staw <i>et al.</i> (1981)	Administrative Science Quarterly	17	985
2	Meyer (1982)	Administrative Science Quarterly	16	464
3	Perrow (1984)	Normal Accidents (Book)	19	406
4	Wildavsky (1988)	Searching for Safety (Book)	19	286
5	Sitkin (1992)	Research in Organizational Behavior	9	294
6	Weick and Roberts (1993)	Administrative Science Quarterly	17	1064
7	Weick (1993)	Administrative Science Quarterly	23	773
8	Bandura (1997)	Self-Efficacy (Book)	24	9230
9	Seligman (1998)	Learned Optimism (Book)	18	140
10	Weick <i>et al.</i> (1999)	Research in Organizational Behavior	15	385
11	Weick and Sutcliffe (2001)	Managing the Unexpected (Book)	17	650
12	Luthans (2002a)	Academy of Management Executive	17	187
13	Rudolph and Repenning (2002)	Administrative Science Quarterly	8	81
14	Coutu (2002)	Harvard Business Review	22	90
15	Luthans (2002b)	Journal of Organizational Behavior	18	269
16	Cameron <i>et al.</i> (2003)	Positive Organizational Scholarship (Edited Book)	18	328
17	Sutcliffe and Vogus (2003)	Positive Organizational Scholarship (Book Chapter)	28	118
18	Rice and Caniato (2003)	Supply Chain Management Review	15	129
19	Hamel and Valikangas (2003)	Harvard Business Review	26	96
20	Christopher and Peck (2004)	International Journal of Logistics Management	20	150
21	Kleindorfer and Saad (2005)	Production and Operations Management	18	283
22	Sheffi (2005)	The Resilient Enterprise	22	220
23	Sheffi and Rice (2005)	MIT Sloan Management Review	21	126
24	Gittell <i>et al.</i> (2006)	Journal of Applied Behavioral Sciences	14	40
25	Luthans <i>et al.</i> (2006)	Journal of Organizational Behavior	14	105
26	Craighead <i>et al.</i> (2007)	Decision Sciences	18	152
27	Luthans and Youssef (2007)	Journal of Management	16	151
28	Youssef and Luthans (2007)	Journal of Management	12	95
29	Luthans <i>et al.</i> (2007)	Personnel Psychology	18	204
30	Avey <i>et al.</i> (2008)	Journal of Applied Behavioral Sciences	6	69
31	Luthans <i>et al.</i> (2008)	Academy of Management Learning & Education	9	79
32	Ponomarov and Holcomb (2009)	International Journal of Logistics Management	15	43
33	Powley (2009)	Human Relations	5	19
34	Avey <i>et al.</i> (2009)	Human Resource Management	10	48
35	Pettit <i>et al.</i> (2010)	Journal of Business Logistics	9	32
36	Luthans <i>et al.</i> (2010)	Human Resource Development Quarterly	8	43
37	Klibi <i>et al.</i> (2010)	European Journal of Operational Research	6	76
38	Juettner and Maklan (2011)	Supply Chain Management: An International Journal	5	9

Cutoff at LCS  $\geq 5$

**Table 3: Core themes in early resilience research**

<b>Paper</b>	<b>Focus of Investigation</b>	<b>Conceptual/ Empirical</b>	<b>Resilience Definition</b>	<b>Theory Development</b>
Staw <i>et al.</i> (1981)	Organizational responses to external threats	Conceptual	Staw <i>et al.</i> focus on rigidity (rather than resilience), defined as the tendency toward well-learned or dominant responses, possibly leading to maladaptive outcomes under conditions of threat.	The paper introduces threat-rigidity theory; the underlying hypothesis of the paper stipulates that an external threat to an organization restricts information processing and control which, in turn, leads to rigidity in response. The authors use multi-level theorizing and develop an isomorphic model which suggests that the relationships observed at one level hold at different levels (i.e., across individuals, groups, and organizations).
Meyer (1982)	Strategic change in hospitals	Empirical, natural experiment in the health care sector, bricolage of ethnography, open-ended interviews, and archival data	Meyer defines resiliency as the outcome of organizations undergoing first-order change and single-loop learning. “Resiliency occurs when responses create negative feedback loops that absorb jolts’ impacts and loosen couplings between organizational and their environment” (pg. 520). Resiliency was operationalized “in terms of the number of weeks needed to restore seasonally normal levels of surgery and occupancy” (pg. 521).	The paper develops adaptation theory, emphasizing variation, selection, and retention processes. The paper stipulates that when confronted with jolts, organizations select and interpret stimuli based on prevailing strategies and ideologies. Filtered stimuli are theorized to elicit organizational responses, leading to resiliency or retention.

**Table 4: Core themes in research on reliability and resilience**

<b>Paper/ Book</b>	<b>Focus of Investigation</b>	<b>Conceptual/ Empirical</b>	<b>Resilience Definition</b>	<b>Theory Development</b>
Perrow (1984)	Social side of technological risk	The book draws on various case examples (nuclear, petrochemical, aerospace)	No definition offered. Perrow focuses on the interactive complexity of systems (arising from a large number of parts, procedures or operators, leading to an inherent potential for unexpected interactions of individual, smaller failures) as well as their tightness of coupling (system processes that occur fast, cannot be turned off or isolated from each other, meaning that disturbances can spread quickly and irretrievably without being stopped by any buffers).	The book introduces Normal Accident Theory, proposing that tightly coupled systems with high interactive complexity will have accidents as a normal consequence.
Wildavsky (1988)	Managing risk in technology	The book draws on various case examples (nuclear power, immune system, tort law)	Resilience is defined as “learning from adversity how to do better” (pg. 2), and the “capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back” (pg. 77)	The book proposes that trial-and-error, rather than the precautionary principle (risk aversion), is the best way to manage risks and improve resilience in unpredictable environments.
Sitkin (1992)	Inherent dangers of organizational success	Conceptual	Resilience is defined as an outcome of organizational learning (pg. 241).	Sitkin introduces a theory of intelligent failure (thoughtfully planned actions that promote experimentation, but are small enough to avoid a major accident or disaster). He proposes that learning from success fosters reliance on proven methods and ‘success formulas’ (which can prevent experimentation and learning), while learning from failure fosters resilience.
Weick and Roberts (1993)	Collective mindfulness	Observational research, triangulation of observations by three faculty researchers	Publication does not refer to ‘resilience’ but addresses aspects of reliability which formed the basis for future work on resilience.	The paper introduces the concept of ‘collective mind’, defined as “a pattern of heedful interrelations of actions in a social system” (pg. 357), and proposes that it leads to performance in contexts requiring nearly continuous operational reliability.
Weick (1993)	Collapse of sensemaking	Weick provides a reanalysis of Maclean’s (1992) book “Young Men and Fire”	Resilience is defined as consisting of four sources: improvisation and bricolage, virtual role systems, the attitude of wisdom, and respectful interaction.	The paper makes a contribution to the sensemaking literature; the four sources of resilience are hypothesized to forestall disintegration of role structure and sensemaking in organizations.
Weick <i>et al.</i> (1999)	High Reliability Organizing	Conceptual	Definition of resilience as the “capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back” (adapted from Wildavsky 1991, pg. 77).	The paper argues that High Reliability Organizations have an underlying reliability which is brought about processes leading to mindfulness (preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, an underspecification of structures) and the subsequent capability to discover and manage unexpected events.
Weick and Sutcliffe (2001)	High Reliability Organizing	Conceptual	Resilience is defined as the ability to “bounce back” (pg. 14).	Similar to Weick <i>et al.</i> (1999).
Rudolph and Reppenng (2002)	Accumulations of interruptions and non-novel events	System-dynamics model	The paper refers to resilience, but no formal definition is introduced. It is assumed that a resilient system is one that can offset the accumulation of interruptions.	The paper develops a general theory of how an organizational system responds to an ongoing stream of non-novel interruptions.

**Table 5: Core themes in post-9/11 research on positive organizational behavior**

<b>Paper/ Book</b>	<b>Focus of Investigation</b>	<b>Conceptual/ Empirical</b>	<b>Resilience Definition</b>	<b>Theory Development</b>
Coutu (2002)	The qualities of people that make them not falter despite suffering through hardship	Conceptual, drawing on a different case study examples	“The skill and capacity to be robust under conditions of enormous stress” (pg. 52).	Coutu argues that three characteristics hold true for resilient individuals and organizations: The acceptance of reality, the propensity to make meaning of an adverse situation, and the ability to make do with whatever is at hand.
Luthans (2002a)	Developing and managing psychological strengths in employees	Conceptual	Resilience is defined as perseverance, “those with positive efficacy will bounce back and be resilient when meeting problems or even failure, while those with low efficacy will tend to give up when obstacles appear” (pg. 60).	The paper develops CHOSE variables (confidence, hope, optimism, subjective well-being, and emotional intelligence) to measure psychological strengths and capabilities of employees.
Luthans (2002b)	Developing and managing psychological strengths in employees	Conceptual	“Resiliency is the positive psychological capacity to rebound, to ‘bounce back’ from adversity, uncertainty, conflict, failure or even positive change, progress and increased responsibility” (pg. 702).	The article identifies confidence, hope and resiliency as unique, state-like psychological capacities that can not only be validly measured, but are open to development and performance management.
Cameron <i>et al.</i> (2003)	Editorial on positive organizational scholarship	Conceptual	Refers to the definition by Sutcliffe and Vogus (2001).	Cameron <i>et al.</i> argue for the need to place a new emphasis on positive organizational phenomena (positive change, emotions and relationships).
Luthans <i>et al.</i> (2006)	Micro-intervention models to impact employee performance	Intervention	The capacity of an employee, when beset by problems and adversity, to bounce back and even beyond to attain success.	Luthans <i>et al.</i> develop a PsyCap (psychological capital) measure and intervention to improve confidence/efficacy, optimism, hope, and resiliency within employees.
Luthans and Youssef (2007)	Review article	Conceptual	Same definition as Luthans (2002b) above.	The paper argues for the extension of previous work on positive organizational scholarship to consider the development of more integrated frameworks and refined measures as well as the measurement of external validity of constructs.
Youssef and Luthans (2007)	The impact of hope, optimism and resilience on work related outcomes	Empirical, two studies	Same definition as Luthans (2002b) above; resilience was measured using Block and Kremen’s (1996) 14-item, 4-point Likert Ego-Resiliency Scale.	The findings of the study generally support that employees’ positive psychological resource capacities (hope, optimism, resilience) relate to, and contribute unique variance to, desired work-related employee outcomes.
Luthans <i>et al.</i> (2007)	The impact of hope, optimism, resilience and efficacy (individually and as a composite higher-order factor) on work related outcomes	Empirical, two studies	Same definition as Luthans (2002b) above. The researchers designed a PsyCap questionnaire capturing hope, optimism, resilience and efficacy, consisting of 24 items in total. Resilience was measured using a 6-item measure, drawing upon Wagnild and Young’s (1993) 25-item, 7-point Likert Resilience Scale.	The paper proposes that the composite PsyCap factor might be a better predictor of performance and satisfaction than the individual measures (hope, optimism, resilience and efficacy).
Avey <i>et al.</i> (2008)	The impact that positive employees can have on organizational change	Empirical, survey study	Resilience is defined as bouncing back from setbacks that are bound to occur during an organizational change process. The authors also quote the definition by Luthans (2002b). Resilience was measured using the above 24-item PsyCap questionnaire (Luthans <i>et al.</i> 2007).	The authors concluded that psychological capital (consisting of hope, efficacy, optimism, and resilience) is related to positive employee emotions that (in turn) are related to attitudes and behaviors relevant to organizational change.

<b>Paper/ Book</b>	<b>Focus of Investigation</b>	<b>Conceptual/ Empirical</b>	<b>Resilience Definition</b>	<b>Theory Development</b>
Luthans <i>et al.</i> (2008)	Investigation whether psychological capital can be developed through a web-based training intervention	Empirical, experimental design	Resilience is defined as the ability, when faced with adversity, to rebound or “bounce back” from a setback or failure. Resilience was measured using the above 24-item PsyCap questionnaire (Luthans <i>et al.</i> 2007).	The authors found support that psychological capital can be developed by a web-based training intervention.
Avey <i>et al.</i> (2009)	Investigation of the impacts of positive psychological capital on employee stress, intentions to quit and job search behaviors.	Empirical	Similar to Luthans <i>et al.</i> (2006), resilience is defined as the ability, when beset by problems and adversity, to bounce back and even beyond to attain success. Resilience was measured using the above 24-item PsyCap questionnaire (Luthans <i>et al.</i> 2007).	The authors found a significant negative relationship between positive psychological capital and the variables of employee stress, intentions to quit and job search behaviors.
Luthans <i>et al.</i> (2010)	Investigation of whether short training interventions can lead to an improvement in employee on-the-job performance	Empirical	Similar to Luthans <i>et al.</i> (2006) and Avey <i>et al.</i> (2009), resilience is defined as the ability, when beset by problems and adversity, to bounce back and even beyond to attain success. Resilience was measured using the above 24-item PsyCap questionnaire (Luthans <i>et al.</i> 2007).	Based on their findings, the authors concluded that an employee’s psychological capital can be developed in ways that result in performance improvement.

**Table 6: Core themes in post-9/11 research on resilient business models**

<b>Paper/ Book</b>	<b>Focus of Investigation</b>	<b>Conceptual/ Empirical</b>	<b>Resilience Definition</b>	<b>Theory Development</b>
Sutcliffe and Vogus (2003)	How can organizations continually achieve desirable outcomes amidst adversity, strain, and significant barriers to adaptation or development?	Conceptual	“The maintenance of positive adjustment under challenging conditions” (pg. 95).	The chapter summarizes past findings on individual, group and organizational resilience and argues that resilience should be seen as adaptability to counteract maladaptive processes such as those outlined by Staw <i>et al.</i> (1981). The authors argue that positive adjustment under challenging conditions is more likely to occur if enabling conditions are present (broader information processing, loosening of control, utilization of slack).
Hamel and Valikangas (2003)	How can organizations develop strategic resilience?	Conceptual	The ability of an organization to dynamically reinvest its business models and strategies as circumstances change. This includes continuously anticipating and adjusting to changes that are threatening the core of the organization, and to change before the need for change becomes desperately obvious.	The authors argue that any organization striving for strategic resilience needs to master four challenges: (1) conquer denial (i.e., to face the reality of a changing world), (2) value variety (e.g., in the form of experimentation), (3) liberate resources (e.g., in terms of seed funding for promising activities), (4) embrace paradox (i.e., exploration of new strategic options).
Gittel <i>et al.</i> (2006)	Investigation of why some airlines emerged successful after 9/11 and demonstrated remarkable resilience compared to others	Empirical case study based on publicly available data	With reference to Sutcliffe and Vogus (2003), Weick <i>et al.</i> (1999) and Wildavsky 1988, resilience is defined as “(a) the maintenance of positive adjustment under challenging conditions [...], (b) the ability to bounce back from untoward events [...], and (c) the capacity to maintain desirable functions and outcomes in the midst of strain [...]”. Resilience is also defined as “a dynamic capacity of organizational adaptability that grows and develops over time” (pg. 303).	The authors conclude that significant differences occurred in the strategies implemented by major airlines after 9/11. Layoffs inhibited recovery throughout the four years after 9/11. The authors argue that financial reserves and viable business models play a significant role in minimizing layoffs and sustaining relationships that enable organizations to return more quickly to full performance.

**Table 7: Core themes in post-9/11 research on resilient supply chains**

<b>Paper/ Book</b>	<b>Focus of Investigation</b>	<b>Conceptual/ Empirical</b>	<b>Resilience Definition</b>	<b>Theory Development</b>
Rice and Caniato (2003)	Resilient supply network design post-September 11	Conceptual	A supply network is resilient if it can respond to unexpected disruptions and restore normal supply network operations.	The article is practitioner-focused and suggests flexibility and redundancy as possible mechanisms to improve resilience.
Christopher and Peck (2004)	Creation of more resilient supply chains	Conceptual	“The ability of a system to return to its original state or move to a new, more durable state after being disturbed” (pg. 2).	The article is practitioner-focused and recommends design principles for creating supply chain resilience, including diversification, redundancy, improved collaboration and agility.
Kleindorfer and Saad (2005)	Risks arising from disruptions to normal activities in supply chains	Conceptual	None provided	The authors propose that mobility and flexibility promote resilience in supply chains better when resources and essential inputs are fungible (e.g., modular design, delayed differentiation).
Sheffi (2005)	Examines how companies can recover from high-impact disruptions	Conceptual, draws on case examples	Resilience is defined as a measure of the ability of a company to, and the speed at which it can, return to its normal performance level following a high-impact/low probability disruption.	With a focus on supply chain management, Sheffi proposes that resilience does not only generate significant “collateral benefits” (e.g., increasing flexibility), but also the advantage to turn disruptions into an opportunity. Defining elements of resilience are redundancy and flexibility/agility.
Sheffi and Rice (2005)	Creation of more resilient supply chains	Conceptual	Resilience is defined as the ability to bounce back from a disruption. A company’s resilience is defined as a function of its competitive position and the responsiveness of its supply chain.	The authors argue that resilience can be achieved by either creating redundancy or increasing flexibility.
Craighead <i>et al.</i> (2007)	How and why is one supply chain disruption more severe than another?	Empirical, multiple-method, multiple-source empirical research design of a global supply chain of a U.S.-based automobile manufacturer	None offered, refers to Sheffi and Rice (2005).	The authors argue that supply chains are inherently risky and will sooner or later experience unanticipated events. They propose that supply chain disruptions are more severe if they occur in more dense and complex supply chains and affect more critical nodes (e.g. a single, critical suppliers), particularly if the supply chain does not have the capability to detect and disseminate pertinent information and respond quickly and effectively.
Ponomarov and Holcomb (2009)	Concept of supply chain resilience	Conceptual	“The adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function” (pg. 131).	The authors propose that supply chain resilience (event readiness, efficient response and recovery) is fostered by dynamically integrated logistics capabilities, leading to greater control, coherence and connectedness of response when encountering unexpected events.
Pettit <i>et al.</i> (2010)	Conceptual framework for supply chain resilience	Conceptual	“The capacity for an enterprise to survive, adapt, and grow in the face of turbulent change” (pg. 1).	The authors propose that resilience increases as capabilities (e.g. flexibility, agility, adaptability) increase.
Klibi <i>et al.</i> (2010)	Review of literature on robust value-creating supply chain networks	Conceptual	“Resilience is the capability of a SCN [supply chain network] to avoid disruptions or quickly recover from failures” (pg. 287).	The authors argue that resilience is a strategic posture of deployed resources (facilities, systems capacity and inventories), suppliers and product-markets. A company can avoid external disruptions (e.g. through vertical integration) or respond to disruptions (‘bounce back’) through flexibility and redundancy.



<b>Paper/ Book</b>	<b>Focus of Investigation</b>	<b>Conceptual/ Empirical</b>	<b>Resilience Definition</b>	<b>Theory Development</b>
Juettner and Maklan (2011)	To empirically explore proposed relationships between supply chain resilience and related concepts, such as supply chain vulnerability	Empirical, Case Study	The authors propose that supply chain resilience is defined by four resilience capabilities (flexibility, velocity/reaction speed, access to timely information, and collaboration among supply chain members).	The findings suggest that the resilience capabilities can help to avoid or limit the impacts of an adverse events (the study context is the global financial crisis) on revenue, cost and lead time/availability targets.

**Table 8: Resilience activation**

<b>Paper/ Book</b>	<b>Focus of Investigation</b>	<b>Conceptual/ Empirical</b>	<b>Resilience Definition</b>	<b>Theory Development</b>
Powley (2009)	Analysis of social mechanisms that enable an organization to resume operations and heal in the time immediately following crisis	Empirical, narrative inquiry and grounded theory to examine a university shooting	Resilience is defined as an adaptive process (referring to Sutcliffe and Vogus 2003); the article introduces the concept of “resilience activation”, referring to “the mechanisms by which resilience emerges or activates when organizations confront threats, challenges, or unexpected emergency situations” (pg. 1292).	The author found three distinct yet interrelated mechanisms of resilience activation: Liminal suspension (the event temporarily undoes and alters formal relational structures and allows organization members to form and renew relationships), compassionate witnessing (feeling empathy for others), and relational redundancy (the activation of relational networks). Powley also sought to contribute to the positive organizational scholarship movement by demonstrating how resilience activation initiates healing processes and restores organizational relationships.

**Table 9: Avenues and questions for future research**

<b>Area</b>	<b>Possible Topic</b>	<b>Possible Research Questions</b>
The context of resilience	Resilience in relation to the organizational context	<ul style="list-style-type: none"> <li>• What type of resilience approach (e.g., high reliability organizing, learning from small losses, experimentation, building employee strengths) is most beneficial to firms, and under what conditions?</li> <li>• Are some attempts at building resilience more or less appropriate given the nature of the company, its industry and/or the threats/crises it may be facing?</li> <li>• What insights can be generated from companies that failed to actively build resilience in certain contexts?</li> </ul>
	Transferability of resilience across contexts	<ul style="list-style-type: none"> <li>• Is resilience specific to a certain situation (e.g., a certain threat/crisis or type of volatile environment), or are there resources, capabilities and organizational structures that promote resilience in a wide variety of different contexts?</li> <li>• Are there underlying mechanisms of resilience that are transferable to or applicable in a range of contexts – for instance, can resilience capacities be ‘dual use’ and ensure resilience against several types of extreme events (see Allenby and Fink 2005)?</li> </ul>
	Resilience in contexts when outcomes are not noticeable	<ul style="list-style-type: none"> <li>• It is likely that many organizations already use resources and capabilities to build resilience against a range of risks – how can we research invisible but perhaps effective results?</li> </ul>
Organizing for resilience	Resilience capacities (resources, structures, processes)	<ul style="list-style-type: none"> <li>• What capacities bring about resilience really? And how do they originate? How do certain capacities (i.e., resources, structures, processes) lead to resilience, and what is their relative importance?</li> <li>• Does resilience require specific structural and organizing principles (e.g., redundancy, flexibility and/or buffer capacities)? If so, are these principles always beneficial or is there any trade-off?</li> <li>• How is the level of loose coupling and slack resources related to resilience? What are ‘appropriate’ levels of slack (structural, relational) that allow building resilience while not imposing competitive restrictions?</li> <li>• How can companies balance demands for reliability and experimentation and manage complexity? Is experimentation not applicable in some instances (e.g., nuclear power) due to the inherent risks?</li> </ul>
	Mindfulness and information processing	<ul style="list-style-type: none"> <li>• To what extent is resilience brought about by information processing occurring before, during and after an event?</li> <li>• Are there limits to foresight and cognition? Are there any paradigms that limit the ability of organizations to recognize and conceive particular actions (see Farjoun and Starbuck 2007)?</li> <li>• How can possible restrictions in information processing and control over a situation be overcome such that an organization can more successfully respond to adversity and avoid more substantial losses?</li> </ul>
Measuring resilience	Operationalizing and measuring resilience	<ul style="list-style-type: none"> <li>• How can/should resilience be operationalized?</li> <li>• How do we know whether or not an organization is resilient prior to the demonstration of its response or performance under adverse conditions?</li> <li>• What are suitable measurement tools and instruments to detect the presence or absence of resilience?</li> <li>• Can insights into resilience be generated by comparing and contrasting findings across case-studies and across different contexts?</li> </ul>
	Detection and activation	<ul style="list-style-type: none"> <li>• Is resilience a quality that ‘exists’ within an organization, or is it something that spontaneously emerges (and only becomes visible) under trying conditions?</li> <li>• Can resilience be successfully subjected to managerial control (for instance, can resilience be actively adopted, maintained, or improved), or do such attempts carry an inherent risk of planning for ‘known’ threats while neglecting the unknown?</li> </ul>
Multi-level and cross-disciplinary work	Synergies employee level and organizational resilience	<ul style="list-style-type: none"> <li>• Are companies with employees that have attributes such as greater mindfulness or greater self-efficacy overall more resilient?</li> </ul>
	Managing resilience in inter-organizational contexts	<ul style="list-style-type: none"> <li>• How is organizational resilience defined and influenced by interrelations and interactions that the organization has with other actors, for instance those along its supply chain?</li> <li>• How can critical interdependencies between organizations be detected and managed?</li> </ul>
	Impacts of the institutional environment on resilience	<ul style="list-style-type: none"> <li>• How does the institutional context influence resilience?</li> <li>• Is organizational resilience mainly brought about by institutional characteristics (e.g., regulations, insurance mechanisms) and not by particular organizational capabilities?</li> <li>• What are policy tools or institutional support mechanisms that foster resilience?</li> </ul>
	Integration of research insights from other disciplines	<ul style="list-style-type: none"> <li>• How do conceptualizations and understandings of resilience differ across disciplines? What are opportunities for cross-fertilization?</li> <li>• How is the resilience of engineered systems (e.g., critical infrastructures), socio-political systems or ecosystems related to organizational resilience?</li> </ul>