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Organizational Resilience

A Dynamic Capabilities Approach

by

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Abstract

The central research question of this thesis is: *how can firms build capabilities in resilience?* Resilience is an ability to adapt to and grow from adversity. The research question points to adversity being both ubiquitous and varying in intensity over time among organizations. Firms will inevitably encounter adversity and either thrive or succumb. Notwithstanding those circumstances when severe adversity besets firms, the best course of action may appear as abandoning the cause. Yet giving up does not build future resilience. Firms inexperienced with adversity can panic in the face of decline and adopt random ad hoc responses, which may do more harm than good. So, resilience to adversity seems important, ubiquitous and unavoidable for firms and so a rich area for theory and skill building.

Turnaround literature offers useful insights into organizational decline and skill-building for resilience but does not incorporate the unique insights that emerge from combining both resilience and capabilities-based views. Turnaround literature can inform as to how to manage an episode of serious decline but fails to show how firms can build this into a capability; a capability that embeds the learning from decline into organizational decisions and actions that can be called upon in future episodes. Moreover, a resilience perspective calls for viewing recovery from adversity, not just as returning to homeostasis but instead encourages growth from adversity. Such growth can involve adopting an entrepreneurial opportunity-forming mindset that uses adverse experiences to inform strategic renewal. Here, the inquiry intersects with dynamic capabilities, which aim to reconfigure firms in the face of change.

This thesis combines these two concepts – resilience and dynamic capabilities – to shed light on how firms go about building capabilities in resilience that may enable them to use adversity to assist in forming strategic opportunities. In studying resilience, the impact

of adversity on capabilities occurred in different empirical contexts. This research project was privileged to follow a firm over a nine-year period where the thesis author was one of the principal directors. This firm experienced three separate episodes of near-death collapse within this period. Using an engaged scholarship methodology, the research was performed by a team of academics and practitioners where the author was both primary researcher and informed participant practitioner. This team used these various perspectives to co-produce knowledge about managing collapse. A careful focus was the ‘dance’ between objectivity of some members of the team and the subjectivity of the practitioners involved. Rich theory emerged through the deliberate arbitrage of these various perspectives. The research thus pursued a theory-building agenda, motivated to understand how firms build capabilities in resilience.

This focus on organizational resilience is expanded in the introduction as Chapter 1, outlining the scope of the research project. Chapter 2 follows as a conceptual work aiming to firmly ground foundational assumptions about the nature of resilience across four key disciplines of psychology, ecology, engineering and management science. The guiding research question is: *what are the conceptual foundations for a resilience-based approach to organizations?* This multi-disciplinary review of the resilience construct revealed that its conceptualization for management considerably lags other disciplines, particularly when compared to psychology. The comparatively impoverished nature of research into organizational resilience motivated the quest for a deeper understanding of its conceptual foundations. The key contribution is the enunciation of a set of robust assumptions about resilience, which seek to overcome the frailties that plague existing usages of the concept in management science. A theoretical model of organizational resilience oriented towards positive adaptive growth is developed based on these assumptions, providing a conceptual foundation for subsequent chapters with inductive theory-building.

Chapter 3 then presents the major empirical study of the thesis. This paper asks the question: *what capabilities are required to survive firm collapse?* The key contribution is a theoretical model detailing how the focal firm learnt to become resilient, in the form of a heuristics-based dynamic capability. This capability set identifies strategic, resource and communication heuristics enhancing resilience across four inflection points which emerged during the firm's collapse.

Chapter 4 then examines the engaged scholarship method, as it developed throughout the research. While this implementation of engaged scholarship is to some extent an unorthodox methodology, this chapter asks: *how can academic and practitioner engagement encourage new real-time knowledge?* The use of this method yielded a rigorous framework for building new theory in deep, privileged contexts, provided real time assistance in resolving the stressed conditions being faced by the focal firm. The key contribution is enunciation of a process of delve-test-innovate-unlock as underpinning how engaged scholarship enabled improved research skills.

Chapter 5 represents the translation of key empirical and conceptual findings for a practitioner audience. It describes how managers may misperceive experiences of collapse, leading to panic and exacerbated consequences. The term 'collapse trap' highlights key features for practicing managers seeking to build capabilities in resilience, addressing the research question: *how can organizations remain capable when their capabilities are gone?* The key contribution is the dissection of key managerial pathology associated with collapse and associated remedies. The thesis concludes with Chapter 6 providing a synthesis of the work to yield an integrated model for building organizational resilience, highlighting the contributions made to the dynamic capabilities view and the role of heuristics when strategy, resources and routines collapse.

Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

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Contributor	Statement of contribution
Russell Manfield (Candidate)	Designed research (90%) Collected the data (100%) Analysed the data (90%) Wrote the paper (90%)
Lance Newey	Designed research (10%) Data analysis (10%) Wrote and edited paper (10%)

Contributions by others to the thesis

I am the main and majority contributor to all sections of this thesis. I am the first author and main contributor for the published paper appearing as Chapter 5, which was co-authored with my principal supervisor. Nevertheless, I acknowledge and appreciate the contributions of each of my supervisors in undertaking intellectual review and editing across all parts of the thesis. No other person has any authorship claims to any parts of the thesis.

Statement of parts of the thesis submitted to qualify for the award of another degree

None

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I undertook this research project not so much to seek a further qualification but to answer a persistent and uncomfortable set of questions that could be reduced to: *why did my firm collapse and what could I do to rebuild it?* At the time, it felt like quite a selfish line of inquiry. At my first meeting with the person who became my supervisor in July 2006, I saw that this question wasn't so selfish after all, as it fitted into a small body of interesting extant literature and could likely be relevant to a wider range of people and firms. It was a pressing and largely under-researched area of study. So here I am completing this particular research journey and opening new doors as I consider integrating into an academic life of teaching, more research, helping people, asking questions and hopefully, deriving insightful and novel answers.

I chose to undertake a thesis-by-papers to develop my analytical and writing skills as well as to explore the interesting and multi-faceted range of phenomena I was experiencing. From the outset I was writing and submitting manuscripts to peer reviewed journals, learning the academic craft by practice and reviewer critique. Through this process, I have improved my conceptualisations, theory building and writing. It also makes me a better engineer, leader of people and implementer of new ideas.

I financed myself through the doctorate and am very grateful to the UQ Business School for accepting me and providing such a resourceful and active research environment, well suited to my particular needs. Both the UQ Business School and the UQ Graduate School have been unwaveringly helpful throughout the programme. I would like to especially acknowledge Ms Julie Cooper of the Business School who has been a support to me from the start and consistently efficient in helping me navigate the higher degree system at UQ.

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Russell Manfield

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Keywords

dynamic capabilities, resources, adversity, collapse, resilience, heuristics, routines, turnaround, stability, engaged scholarship

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Preface

From the outset of this research project, I appreciated that many different phenomena could be embraced that may or may not prove to be conceptually inter-connected. To accommodate this likelihood, I adopted a thesis-by-papers approach so that discrete, potentially stand-alone writing could explore these phenomena as they might emerge from the data. As an added benefit, this approach allowed me to gain practice with the core skill of academics, to write papers proposing new knowledge for peer review. The insightful feedback I have gained from reviewer comments throughout this project has been of enormous benefit to me in developing my academic skills.

Consequently, four chapters (Chapters 2 to 5) were initially framed as manuscripts for publication in various peer reviewed academic journals. These chapters are preceded by an Introduction (as Chapter 1) and summarised by a Conclusion (as Chapter 6). Given this thesis-by-papers approach, each of the four chapters are a standalone item, but showing a progressive development towards the conclusions. The transition from each of these manuscripts to the next is explained by a brief preface introducing each subsequent chapter. This transitional section introduces the progression of thought from the previous chapter to the next as well as noting any publication intentions of the subsequent chapter.

Since these papers are intended for a range of journals, the style of writing varies according to the target audience and editorial requirements. Some particular features have been modified for the purpose of consistent thesis presentation. Also, text boxes, tables and figures have been included in the line of text, as these would appear when read, rather than maintaining the usual manuscript convention of collecting tables and figures at the end of the text after the bibliography.

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List of Abbreviations

AS	Collective label for the ActiveSky group, including companies registered in California (as ActiveSky, Inc), Japan (as ActiveSky KK) and Australia (as ActiveSky Pty Ltd). Also various associated entities that together are referred to as ActiveSky
ASX	Australian Stock Exchange
GFC	Global Financial Crisis
IP	Intellectual Property
IPO	Initial Public Offering
PhD	Doctor of Philosophy
Telco	Telecommunications carrier or provider
UK	United Kingdom of Great Britain and Northern Ireland
UQ	University of Queensland
US	United States of America

CHAPTER 1 | ORGANIZATIONAL RESILIENCE

A Dynamic Capabilities Approach

1.1 INTRODUCTION

Building a new firm from scratch can be an exciting and lucrative endeavor (Bhidé, 2000). Growing an already established firm to greater levels of performance and returns can be similarly rewarding, perhaps especially when such growth continues to be pursued after the firm has experienced a setback or series of setbacks (Powell & Baker, 2014). The very nature of business in complex capitalist economies means that unexpected events arise, both inside and outside the firm (De Carolis, Yang, Deeds, & Nelling, 2009). Consequently, navigating adverse conditions is the norm rather than the exception in managing business ventures (Bhidé, 2000).

The notion of a sustainable competitive advantage suggests that firms seek continued growth and are able to sidestep obstacles that arise along the way (Barney, 1991). This linear equilibrium view often doesn't reflect lived experience (Agarwal, Audretsch, & Sarkar, 2007). Even the assumptions of punctuated equilibrium (Gersick, 1991), where periods of stability are interrupted by relatively short periods of turbulence that need special management, belie the type of market and organizational dynamism faced by many firms. While there are many studies exploring strategy and stages for growth in business (a review of growth models is given by Levie & Lichtenstein,

2010), there are far fewer exploring the beneficial role of adversity in enabling renewed growth, where new opportunities are formed (Alvarez & Barney, 2007) and new capabilities learned (Zollo & Winter, 2002). Yet there has been a growing literature on firm failure (Mellahi & Wilkinson, 2010; Mitchell, Mitchell, & Smith, 2008).

The middle ground of navigating adversity is less well understood. Literatures such as organization decline (van Witteloostuijn, 1998), turnaround (Chowdhury, 2002) and persistence (Holland & Shepherd, 2013) have made useful contributions to the area. The imbalance is so distinct that one could form the view that when things get tough, it's probably an indicator to pack up and search for a new project (Dew, Goldfarb, & Sarasvathy, 2006). Yet setbacks can open the door to many rewards as well as pitfalls (De Carolis et al., 2009). Harnessing the rewards is a space well covered but navigating the pitfalls is less well understood.

This thesis explores the actions undertaken when conditions turn sour, strategy fails and resources dissipate; yet survivors of a firm choose to persist and seek to rebuild. The study isn't seeking to understand why entrepreneurs make such decisions (Powell & Baker, 2014) nor the passions that drive them (Gielnik, Spitzmuller, Schmitt, Klemann, & Frese, 2015). This choice juxtaposes courageous persistence with foolish over-commitment, since the wisdom of either of these two conditions can only be assessed in hindsight. The firm that tackles daunting obstacles head on and eventually carves a market niche for itself, earning modest or even promising returns, is judged as courageous

(Rumelt, 2011). The same firm, tackling the same obstacles but failing to gain eventual traction is often judged, in hindsight, as foolish, as if the futility of such an attempt was easily apparent at the time (Raynor, 2007).

Conditions of uncertainty represent more than a lack of information. Uncertainty means that the consequences of any particular set of actions can only be known by undertaking those actions and observing the results; they cannot reliably be predicted against some known risk profile because the causal relationships are too complex and some or even most of the interacting parameters unknown or unknowable in advance (Knight, 1921). Under conditions of uncertainty, actors within a firm can only focus on known relevant information and must ignore the remainder (Gigerenzer & Gaissmaier, 2011). The process for collecting these individual heuristic actions into collective capabilities as a firm learns to navigate uncertain conditions with both routine and non-routine actions has attracted some study (Bingham, Eisenhardt & Furr, 2007). These non-routine or idiosyncratic actions required for “*transforming the enterprise and shaping the eco-system*” (Teece, 2012: 1395) would appear to provide a key to navigating conditions of uncertainty.

It is at the collective action level where the full impact of this shifted focus is realized. Accordingly, the unit of analysis for this thesis is the organization. Remaining capable in achieving positive results when the environment outside the firm is chaotic, uncertain and uncontrollable and the resources and actions inside the firm are unreliable is difficult in practice (Manfield & Newey, 2015). Even in theory, while a range of literatures cover

varying aspects of navigating such uncertainty by exploiting perceived competitive advantages, as outlined in Table 1, each of the six chosen literature sets adopts different approaches with different limitations and none fully encompasses the dynamic space. Even the capabilities construct, which would appear to directly address the issue of what actions a firm can or cannot do, consistently assumes underlying conditions of resource sufficiency and strategic coherence in sustaining firm performance (Ambrosini, Bowman, & Collier, 2009; Eisenhardt, Furr, & Bingham, 2010). Capabilities are commonly assumed as being built on routine actions, even to the extent of assuming routine sequences in changing the configuration of the resource base and the way these resources are used (Helfat et al., 2007). Such framing applies an evolutionary view of routines but seems to do little to inform radical shifts in action that underpin creative destruction and innovation (Schumpeter, 1934), especially under adverse conditions.

Both decline and turnaround models commonly adopt a staged theory perspective, implying some rigidity in the number and sequencing of stages, resulting in a sense of an inevitable, even deterministic, lifecycle (Levie & Lichtenstein, 2010). These models encompass a bias towards routine actions as the firm navigates adversities in order to regain the oft-articulated goal of organizational capabilities, being sustained competitive advantage (Collis, 1994). In addition, while Collis (1994) argues that the dynamic capabilities approach is vulnerable to 'infinite regress', my field research indicates that organizations are able to maintain two sets of capabilities – operating and dynamic – without the need for an infinite regress.

The notion of simple rules is usually couched in terms of high velocity environments (Eisenhardt & Sull, 2001) yet needs care in guiding a firm to detect when such rules are ecologically rational, or not (Gigerenzer, 2008).

An interesting development of post-traumatic growth has been identified in the psychology literature (Masten, 2014; Pat-Horenczyk & Brom, 2007; Zoellner & Maercker, 2006). By this construction, adversity can drive an increase in capabilities resulting in superior levels of performance than existed prior to the adversity arising. Such an occurrence has also been referred to as a resilient reintegration (Richardson, 2002). Indeed, the ecology domain also embraces the concept of resilient systems achieving improved performance after adverse impacts (Walker & Salt, 2012) but, like psychology, the construct needs greater definition and modeling to be applied more broadly. Key literatures relevant to resilience and other constructs are compared in Table 1.

A framing of growth through adversity is helpful to the organization sciences (Carver, 1998; Jacobs, 2005). Accepting that adverse conditions are a normal part of doing business requires a consideration of how the resilience of the firm can be developed (Lengnick-Hall & Beck, 2009). The capabilities lens draws a focus to the firm's internal attributes; its resources of people, alliances and other assets as well as the actions by which these resources are coordinated to work together to achieve common goals (Teece, Pisano, & Shuen, 1997).

Informing the sequences of action a firm can undertake as it seeks to survive and prosper from adverse conditions is the focus of this research. This approach is relevant to researchers seeking to build more robust theory around

the capabilities of the firm and to managers at the coalface of navigating promising and challenging conditions. Accordingly, the overall research question is: *How can firms build capabilities in resilience?*

To review what is known on this topic, I considered literature on organizational decline to gain an understanding of firm collapse. I consulted turnaround literature to examine how firms could be guided in building resilience. Because the thesis question explores organizational capabilities, I also considered their anatomy across operating and dynamic types in states of both construction and dismantling. Some dynamic capability literature also references the role of heuristics in addition to routines. Further, organizational resilience as an expression of capability growth after trauma was also referenced in some literatures. Accordingly, I have compiled Table 1 as a comparison of these key literatures relevant to the overall research question.

1.2 A RESILIENCE CAPABILITY APPROACH

The construct of resilience has a strong history in the psychology domain spanning some 50 years (Luthar, 2006). Along a similar yet independent path and an even longer period, ecological resilience has sought to understand how landscapes, wildlife populations and socio-ecological systems can be sustained under conditions of environmental stress (Allen, Cumming, Garmestani, Taylor, & Walker, 2011). In the engineering domain, resilience is understood as the building of systems that can retain normal function under a range of conditions or regain such normal functioning after external forces return to

Table 1: A comparison of key literatures relevant to the overall research question

Literature	Contributions	Limitations	How a capabilities approach will overcome limitations	Relevance to overall research question
Decline (Cameron, Whetten, & Kim, 1987; Lamberg & Pajunen, 2005)	Shows sequence of steps through decline as consequence of strategy	Shows decline as single linear trajectory, depending on strategic choice when such options are limited	Show what capabilities can be built at various points	Informs the perceived collective stages and antecedents of decline along with a range of remedies for each stage
Turnaround (Barker & Duhaime, 1997; Chowdhury, 2002)	Shows possible inflection points	Adopts a staged sequence schema	Allows for iterative efforts to recover from decline or turbulence	Focus on recovering a firm's competitive advantages assuming robust context prior to setbacks
Operating capabilities (Newey & Zahra, 2009; Teece, 2014; Winter, 2012)	Routine actions drive robust & repeatable efficient outcomes	Cannot function without routine actions	Attracting & configuring resources even without routine actions enable iterative entrepreneurial actions	Robust outcomes imply collective resilience across bounded array of conditions
Dynamic capabilities (Eisenhardt, Furr & Bingham, 2010; Helfat et al., 2007; Teece, 2012)	Framework for reconfiguring resources and the routine actions that exploit them	Role of routines in rapidly changing environments, both endogenous & exogenous	Heuristics adopted by individuals can allow new collective capabilities to form despite strategic & resource turbulence	Establishes mechanism for changing collective actions while embracing goals of performance & flexibility
Simple rules (Bingham & Eisenhardt, 2011; Eisenhardt & Sull, 2001)	Focus on essential data & ignore irrelevant information	Ecological boundaries often obscure	Focal heuristics informed by decline-collapse-rebuild meta-sequence of dynamic states	Provides foundation for individual rules to be aggregated into new, idiosyncratic collective actions to resolve uncertainty dilemmas
Post-traumatic growth (Martin & Sunley, 2015; Watts & Paciga, 2011)	Distinguishes growth cognitions from growth actions in improving post trauma performance	Insufficient reliable data to support a valid model	Potentially informs the origins of capabilities as deliberate sequences of action forming and resource accumulation	Frames adversity as a distinct & promising occurrence for the firm to achieve goals unobtainable absent such adversity

within a desired range (Woods, 2006). While the organization sciences have explored resilience as a desirable search for positive adaptation to adversity (Afuah, 1999; Mallak, 1998) for perhaps the last couple of decades, it has been slower than the other domains of research to devise models of development that inform business practice and enhance organizational function across a range of distressed operating conditions (Weick & Sutcliffe, 2007 being an exception).

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Given the concurrent yet largely independent development of the construct across these various domains, I expand on this brief overview in the next chapter. For this research, I adopt a definition of resilience from organizational literature, as *a firm's ability to effectively absorb, develop situation specific responses to, and ultimately engage in transformative activities to capitalize on disruptive surprises that threaten organizational survival* (Lengnick-Hall, Beck, & Lengnick-Hall, 2011: 244).

A capabilities approach to resilience offers a number of advantages. First, the capabilities perspective integrates an accepted, well established lens to incorporate resilience as part of the hierarchy of activities. Under this hierarchy, activity sets are applied to existing resources as zero order activities, robust and reliable routines of action yield competitive advantages as first order activities, known as operating capabilities, and further actions reconfigure these routines in response to environmental changes as second order activities, or otherwise referred to as dynamic capabilities (Ambrosini et al., 2009; Danneels, 2012; Hine, Parker, Pregelj, & Verreyne, 2014). This division of routines, operating capabilities and dynamic capabilities in the context of resilience allows a segmentation of actions towards building robust adaptations at various levels of organizational endeavor.

Second, such an approach embeds the notion of reliable and repeatable action into this interpretation of resilience, beyond simply phases of evolution and revolution addressing various sequences of crisis and resulting growth as a function of the size and maturity of eth firm (Greiner, 1972). This means that a

resilience capability is not simply an option that may be nice to have under some circumstances, but rather an essential quality to be developed for a firm to realize competitive advantage through good, strategically coherent and resource sufficient times, along with the challenges accompanying adverse conditions of strategic and resource collapse (Manfield & Newey, 2015).

Third, capabilities and in particular dynamic capabilities, embody change where the firm must make rational decisions based on the opportunities and resources it can attract and develop (Sull, 2004). Since resilience is primarily concerned with the process of adapting to challenging complex conditions, viewing resilience through the capability lens represents a dynamic alignment (Lengnick-Hall & Beck, 2009) that seeks to avoid the converging focus of a path dependency approach (Sydow, Schreyögg & Koch, 2009) and to rebuild efficient yet flexible performance (Eisenhardt et al., 2010).

By adopting the capabilities lens, I aim for theory to describe how firms can be more resilient over time and therefore more likely to gain sustained competitive advantage while experiencing both promising and adverse conditions.

1.3 THESIS MOTIVATION

The impetus for undertaking this research program came from my experience at a technology start up called ActiveSky. I joined the firm when it was less than two years old in 2001, as the Finance and Operations Manager based in Australia. My initial role was to support the activities for the core software

development efforts, themselves led by the technology inventor. I initially reported to this founder and about a year later to the Chairman and CEO, based in Silicon Valley, as I became more involved in operational matters across the entire organization.

From the time I joined the firm through to when I began my PhD program in 2006, I was aware of a range of literatures covering entrepreneurs, start ups, strategy and capabilities. From my research, none of these seemed to address the complex set of issues facing this particular firm nor indicate productive next steps. Primarily, I judged that the options available to the firm were fundamentally restricted when it was struggling to find a coherent strategy or had lost much of its resource base. Commonly, the literatures I accessed at this time (eg: Baker & Nelson, 2005; Bourgeois & Eisenhardt, 1987; Helfat, 2000; Helfat & Peteraf, 2003; Sheppard & Chowdhury, 2005; Teece et al., 1997) assumed conditions of strategic coherence and resource sufficiency, which appeared largely irrelevant to ActiveSky. To place this frustration into context, it's helpful to give a brief outline of the conditions that existed at ActiveSky from its foundation in 1999 through to the present.

Focal Case Inspiration

ActiveSky had begun life as a then radical wireless technology platform for compiling and distributing video and other interactive data files over public mobile networks during 1999. The technology inventor was able to build concept-proving prototypes that quickly attracted investor attention, with a modest Series A investment round late in 1999 enabling a more adventurous

Series B raising of US\$22mill early in 2000, just before the dotcom collapse in April of that year. Despite the change of market sentiment to technology ventures, ActiveSky began laying down the foundations of a substantial firm with extensive capabilities to develop, test and deploy their radical wireless technology. By the close of 2000, they operated 5 offices around the globe, headquartered in Silicon Valley with software development undertaken in two offices in Australia, product engineering in Japan and a small sales office in UK.

The business development team had to educate an entirely new market to the commercial potential of wireless service delivery at a time when most players were still trying to understand how to harness the internet for new revenues. For a year or so, ActiveSky was courted by major players around the world, sensing that ActiveSky provided a solution to wireless delivery that no other platform offering could claim at that time. Despite internal conflicts over strategy, the firm secured groundbreaking venture agreements in US and Japan, along with a string of concept trials with major telcos in US, UK, Germany, Australia and Japan. By 2003, however, the company was in deep trouble. Their tagline of “*write once, deploy anywhere*” implied a simple translation of collateral built for the web to be seamlessly deployed to handheld devices. This promise could not be fulfilled. Wireless devices, particularly mobile phones, were not consistent in their performance, commonly not even adhering to their manufacturers’ own specifications. ActiveSky found itself constantly reworking its source code to accommodate these device variations, resulting in quite slow deployments to new handsets as these were released to market. Once deployed, many surprise technical glitches arose as handsets failed to perform as

specified, tying up extensive resources for panicky quick fixes.

Large corporate backers lost their enthusiasm for the ActiveSky platform when the anticipated exponentially growing revenues from wireless offerings did not eventuate. End users commonly compared the wireless offering of ActiveSky to that of the emerging fixed-line broadband services. Surprisingly, ActiveSky sometimes was judged as superior but more commonly end users wanted more features, faster downloads and greater personal configurations, just like they were getting used to with fixed-line internet applications. ActiveSky found itself in a downward spiral, as more resources were directed to patch up gaps in a bid to meet these features expectations and increasingly ignoring foundation development of a robust underlying platform.

As a start up with enormous growth potential in an emerging wireless market and even greater return on investment expectations, ActiveSky lacked a disciplined approach to strategy, resource allocation and capability growth. The early mindset of the firm assumed success and its strategy and resources reflected this assurance. Even in 2003, when revenues continued to fall well below expectations, the company was spending ten times as much as it earned, depleting precious investor capital. The Series B funding ran out. The Series C funding round early in 2004 tried to stave off collapse for long enough to effect a trade sale. These funds too ran out, so the investors agreed essentially to walk away, handing control of the firm and its patent assets to a few surviving members based in Australia. I was one of these survivors and led the buyout.

After securing full control of the firm along with modest new investment

late in 2004, the survivors set about to rebuild the company from a depleted condition, seeking to realize the full potential of what they considered world changing wireless technology. The dominant mindset at this time was that this small surviving team could make better choices, avoid the strategic missteps and wasteful resource allocations of the earlier incarnation and in doing so could rebuild organizational capabilities to carve out a new high growth trajectory. Despite a string of promising opportunities, these ambitions were not realised. It was here I began to explore academic literature in an effort to understand why such a promising company had failed and what it could do to rebuild. On the back of these bruising experiences, the first research proposal that led to this thesis was written early in 2006.

ActiveSky did gain access to new markets in India, Malaysia and Singapore. These deals supported the momentum for an initial public offering as a media/technology entity, proposing to acquire four established and growth oriented firms in Australia and US, for ASX listing late in 2007. Yet the global financial crisis of 2008 brought the IPO ambition to painful end. ActiveSky exists today despite the fundamental changes in the wireless marketplace and could yet provide new growth opportunities.

These experiences have formed the backbone of the research material to answer the question of how a firm can rebuild its capability after suffering strategic and resource collapse. The interaction with academic literature for strategy, capabilities and resilience directly shaped how the persistent survivors of ActiveSky navigated the setbacks and interpreted growth opportunities. In

this regard, ActiveSky represents success as a research subject through its repeated failures allowing insights from comparative real time observations by deeply embedded actors. The firm does not need to ultimately prove successful in the conventional sense of achieving high growth or profits, since it allows study of otherwise difficult-to-access phenomena of organizational resilience.

1.4 THESIS STRUCTURE

This chapter serves to introduce the overarching thesis research question and the supporting literatures for exploration in subsequent chapters, each anchored with a sub-question of the overall thesis research question. Table 2 below lists how each of the following four chapters relates to the core research question, along with the major contribution to literature. The concluding section of the thesis (Chapter 6) then recapitulates the contribution of each chapter before focusing on their integration, providing an integrative and comprehensive response to the overall thesis research question.

Chapters 2 through 5 are written for journal manuscripts, one of which (chapter 5) has so far been published. The thesis was conceived as a collection of journal manuscripts in order to facilitate an expected multi-faceted approach to embrace the breadth of theoretical material and practitioner applications derived from the overall research question. Not only does this approach allow several facets of the central phenomenon to be addressed, but it also provided an opportunity to develop a range of writing styles for empirical and conceptual theory development, addressing academic and practitioner audiences.

The thesis represents the culmination of a highly iterative development process over the last nine years. Earlier work has been exposed to the journal review process, mostly A* (see the publications during candidature section on page vi). This exposure has added considerably to the robustness of the papers presented for thesis review. My point is that the ideas and contributions have had a long gestation and are summarized below in Table 2.

1.5 RESEARCH METHOD

This thesis pursues a theory-building research agenda. This is because organization resilience theory is lacking consistency regarding how it can be built from given antecedents to yield positive outcomes. In order to address the thesis research question then, an iterative process between data to theory is needed, where the general direction is from empirical to conceptual data.

I undertook a theory-building process of engaged scholarship using ActiveSky as a focal case study. Engaged scholarship (Van de Ven, 2007) seeks to leverage deep privileged access to strategic and operating decisions in real time, to build new theory. Exploiting such privileged knowledge offers context specific tests of rival hypotheses towards generalizable theory, with theory building being driven by integrating the subjectivity of practitioners with the objectivity of researchers (Van de Ven, 2007). The conceptual process of engaged scholarship is given in Figure 2 below and expanded with data and lived experience in Chapter 4.

Table 2: Arrangement and contribution of the four chapters written as journal manuscripts, representing Chapters 2-5 respectively.

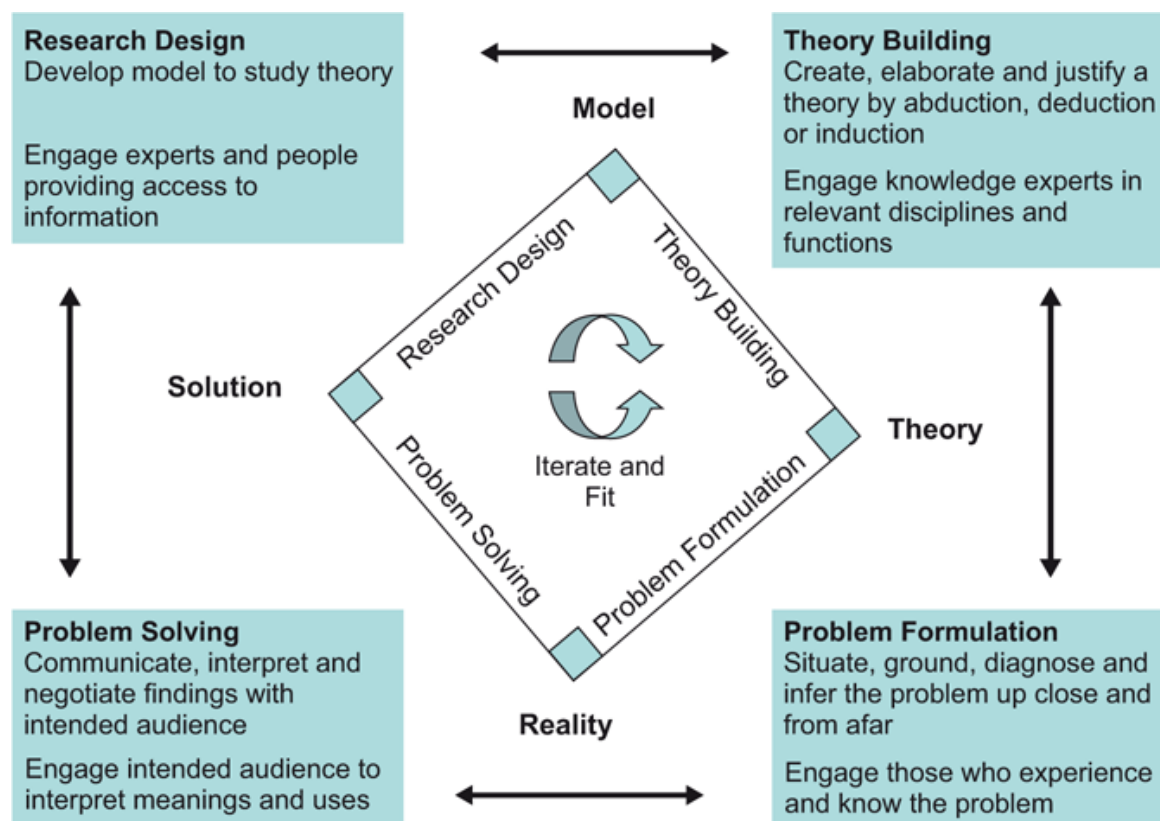
Chapter	Research Question	How relates to overall thesis research question	Type of study	Primary Audience	Main Contributions
2	<i>What are the conceptual foundations for a resilience-based approach to organizations?</i>	Understanding organizational resilience requires identifying conceptual foundations including assumptions regarding the nature of resilience and how it can be built	Conceptual	Academic	A process model of organization resilience including antecedents, processes, orientations and outcomes
3	<i>What capabilities are required to survive firm collapse?</i>	Longitudinal, real time case study which uses 14 years of data to build theory of how focal firm built resilience capabilities following three episodes of decline-collapse-rebuild	Empirical multi-case	Academic	Theoretical model of how focal firm built heuristics-based dynamic capabilities for navigating and growing from collapse through purposeful capability dismantling during collapse and capability re-building post-collapse
4	<i>How can academic and practitioner engagement encourage new real-time knowledge?</i>	Detailed articulation of how the engaged scholarship method was applied and the insights it enabled through iterations of theory building and problem solving	Conceptual	Academic	Advances rigor-real time-impact nexus to explore impact goals and gives an empirical example of engaged scholarship method to include real time assistance and research impact
5	<i>How can organizations remain capable when their capabilities are gone?</i>	The building of capabilities in resilience requires understanding the anatomy of collapse and adjusting practical strategies to different phases in a cycle of decline-collapse and re-build	Empirical case study	Practitioner	Offers detailed practical guidance to practitioners experiencing collapse, including documenting the major phases of collapse and the adjustment of practical strategies as each phase is encountered

The research explores the resilience experience of ActiveSky across a period spanning a total of 14 years of case data. Most of the data was collected in real time. While the study focused on one firm, it derived distinct cases to yield an embedded case structure (Yin, 2009). The advantage of this study is the deep and privileged access to the firm's principal decision-makers.

The ActiveSky case provided an excellent basis for this style of empirical analysis. A total of 24 informants, including myself as an insider informant and researcher, provided information to the study either as transcribed semi-structured interviews, email files or diary notes. In addition, I had access to the entire archive of code development, technical documentation, marketing presentations, legal documents and investment proposals that allowed both real time and retrospective analysis of decisions and actions to be made.

Other scholars have commented how inherent discontinuities, commonly overlooked or assumed away, disrupt a clear and linear understanding of a theoretical representation of a history and instead proposed true understanding as flowing from a study of the transformations that occur (Foucault, 1972). Accordingly, the engaged scholarship method embraces the turbulent histories of the case to highlight the disruptions that arose, the boundary conditions that applied and the transformations that occurred. It also allows an exploration of participant expectations and the determination of the best course of action. *"They can approach the problem instrumentally, trying to establish an equilibrium using a sort of "mirror reasoning" that is familiar from game theory. This generates what Habermas refers to, following common usage,*

as strategic action. The alternative is that they can talk to one another, announcing intentions, issuing imperatives and making assertions. In so far as they are able to establish a set of stable mutual expectations in this way, Habermas refers to it as communicative action” (Heath, 2011: 80). These notions of boundary conditions, transformations, strategic action and communication form critical elements of the analysis that follows in later chapters resulting from the engaged scholarship that applies the academic craft of theory building to the realities of practical experience.



Source: Adapted from Van de Ven (2007)

Figure 1: The generic iterative cycle of engaged scholarship through four stages

In line with Figure 1 above, analysis of this deep data was undertaken iteratively and in collaboration with some of the informants and academic staff supporting the research. This analysis often began with identifying a circumstance or condition that existed in ActiveSky that either contradicted or was not addressed in the literature. By formulating a problem that reflected a real condition and proposing a possible theory to explain the problem and predict successful solutions and then re-engaging with the real case to see if or how that particular problem was solved by applying that possible theory, new pathways were developed.

A clear example of this process occurred with the development of the cyclic nature of the decline, collapse, rebuilding sequence. For the early stages of theory development, I worked on the presented timeline of capability growth and then a long tail of decline with some perturbations at various stages, roughly consistent with a punctuated equilibrium conceptualization (Gersick, 1991). Yet this conceptualization of capability performance did not provide insights into the complex dynamics of efforts to rebuild opportunities, nor did it inform the notion of organizational resilience development. By iteratively collaborating with informants, the model evolved into the cyclic decline-collapse-rebuilding sequence. This breakthrough was only achieved by real-time iterative analysis with academic and practitioner informants. I contend it could not have been achieved by retrospectively analyzing case data alone.

Importantly, a key aim from the outset of this thesis research is to conduct research that bridges the rigor-relevance divide. This divide recognizes

that knowledge is of different types – the knowledge of the academic is different to that of the practitioner but their integration in theory building is possible. Thus, the integrative approach of engaged scholarship helps to cultivate theoretical rigor in a way that connects with the subjectively experienced world of the practitioner.

1.6 SUMMARY STATEMENT OF CONTRIBUTIONS

Theoretical

As introduced earlier in Table 2 each of the following chapters makes an individual contribution to particular literatures, as these manuscripts target. In terms of the overall thesis a number of key contributions are made. First, I offer a detailed empirically grounded understanding of the anatomy of firm collapse. Such understanding lays a foundation for an organization resilience research agenda (a "future research" goal articulated in Limnios, Mazzarol, Ghadouani, & Schilizzi, 2014). Understanding resilience necessitates exploring how firms experience adversity and collapse.

Second, I offer a resilience perspective to the phenomenon of organizational adversity, decline and collapse (Holland & Shepherd, 2013; McGrath, 1995). A resilience perspective explicitly emphasizes how firms learn to be more 'capable' in adversity (Manfield & Newey, 2015). Such 'capability' represents a third option for firms beyond the usual dichotomy of escalation of commitment or abandonment (Ghemawat, 1991; Ross & Staw, 1993; Slesman, Conlon, McNamara, & Miles, 2012).

Adversity is an opportunity for ‘sensing, seizing and transforming’ (Teece, 2007, 2012) into new pathways previously unseen or unavailable. Accordingly, my third contribution is to extend existing treatments of organization resilience by taking a dynamic capabilities perspective. This offers a way to understand the dynamic, adaptive aspects of resilience in conditions of adversity so that resilience can be purposefully built as a reliable positive capability. In addition, it also probes the boundary conditions of these dynamic capabilities for firms navigating high velocity conditions in terms of sustainability and competitive advantage (Peteraf, di Stefano & Verona, 2013) and distinguishes between capabilities - both dynamic and operating - built on routines (Helfat et al., 2007) and those built on heuristics (Bingham et al., 2007).

Fourth, I offer new understandings and insights into heuristics-based dynamic capabilities for organization resilience, explored in Chapter 3. This contributes to the growing research into heuristic-based, as opposed to routine-based, dynamic capabilities. Circumstances of adversity can cripple the firm’s resources and expose them to a fight for survival in highly uncertain fluid contexts. When routines become inadvisable or unavailable, heuristics give shape to ad hoc entrepreneurial action (Teece, 2012).

Fifth, I draw on the conceptual development of resilience in other disciplines to more fully identify key assumptions about resilience to serve as the foundation for a resilience research agenda in management sciences. This cross-domain comparison, in the next chapter, is particularly relevant to

framing positive adaptation responses to adverse conditions (Martin & Sunley, 2015).

Sixth, informed by process research methods (Langley, 1999), I am able to connect these insights into a process model of organizational resilience shedding light on antecedents, processes, orientations and outcomes. Such a model exposes how different approaches to resilience can lead to different outcomes.

Practical

This research draws on deep privileged information from rich case data not commonly available to researchers, to offer new insights for managers navigating states of collapse. By moving beyond simple linear models of decline, with collapse as an annihilating endpoint, and offering an iterative sequence of navigating a changing array of boundary transitions exploiting various classes of heuristics, the model helps practitioners to purposefully dismantle existing capabilities in preparation for strategic and resource collapse. Such dismantling actions are decided on rules that seek to ignore the irrelevant information and make simple decisions based on a narrow sub-set of relevant data to persevere through collapse towards positioning the firm to rebuild fresh capabilities around new resource configurations and adaptive activity sets.

Specifically, this work shows where managers should focus their efforts in the turmoil of decline and restricted options. Instead of attempting to turnaround with current resource and activity sets, this work shows a process

to strip high resource consuming assets and enable opportunity creation heuristics, to select, process, time and prioritize options as these form. If such formation gains insufficient traction to enable new capabilities then managers are guided to re-iterate through collapse of those actions and resources. By developing theory in this area managers can then avoid typical paralyzing responses in the face of adverse conditions and learn to be capable even when traditional capabilities are gone (Miller, Eisenstat, & Foote, 2002).

1.7 GLOSSARY OF KEY TERMS IN THESIS

Capabilities	reliable and repeated sequence of actions using resources to yield robust positive outcomes for the firm
Dynamic Capability	capacity of an organization to create, extend or modify its resource base towards strategic goals
Routines	repeatable sequences of action using resources controlled by the firm
Adversity	negative disruption to an organization's strategic or operational actions or resource base
Strategic Collapse	inability to implement plans to achieve intended positive goals for the firm
Resource Collapse	key assets such as staff and cash reserves become unavailable or inaccessible so blocking reliable delivery of products and services
Resilience	ability to withstand and adapt to disruptive, adverse conditions that threaten firm survival

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Preface to Chapter 2

Introducing the Conceptual Foundations for Organizational Resilience

The purpose of the next chapter is to lay a foundation for understanding organization resilience, through a multidisciplinary review that asks: *what are the conceptual foundations for a resilience-based approach to organizations?*

These four disciplines spanning psychology, engineering, ecology and organization science offer the most active development of the construct of resilience. The multidisciplinary review allows comparisons of the concept of resilience in order to draw insights that might be useful in organization science.

Although the systems studied in these other disciplines are different to organizations, the respective underlying assumptions are exposed, allowing a clarification of the nature of resilience and so securing a better foundation for a resilience research area in organization science. A paper based on this chapter is targeted for submission to the International Journal of Management Review.

CHAPTER 2 | BOUNCING FORWARD

A Dynamic Capability View of Organizational Resilience

ABSTRACT

While use of the concept of resilience is on the rise in the management sciences, it lacks clarification of underlying assumptions. Yet resilience has a strong history across various disciplines. This paper reviews the key issues exposed by this history in the domains of psychology, ecology, engineering and organization science concerning the nature of resilience. The review clarifies the assumptions that can be used to build a conceptualization of organizational resilience. These assumptions lead to a process model of organizational resilience with an underlying idea that different orientations to resilience enable the development of different dynamic capabilities. In turn, these different capabilities lead to different outcomes from threats and the resulting disorganizations. Resilience building can invoke a deliberate heuristic process in response to particular threats, whereby a firm learns to deploy such heuristics with an orientation of growth from adversity, not just recovery to previous levels of performance. The chapter contributes to the dynamic capabilities view by dissecting different types of disorganization which can ensue from threats, approaches to resilience and the heuristics which support processes of sensing, seizing and transforming in order to build a dynamic resilience capability.

2.1 INTRODUCTION

Firm failure, organizational decline and irregular performance can beset even the best of firms. Different theoretical perspectives try to account for why business failure rates are high (Stuetzer, Obschonka, Davidsson, & Schmitt-Rodermund, 2013). Economic theories may assert that firm exits are a sign of an efficient economy shedding inferior businesses. This fatalistic view is balanced by literatures such as turnaround (Barker & Duhaime, 1997; Morrow, Sirmon, Hitt, & Holcomb, 2007; Shein, 2011) and dynamic capabilities (Helfat et al., 2007; Teece, 2007; Zahra, Sapienza, & Davidsson, 2006) which assert proaction, resilience and optimism regarding the ability of firms to endure and recover from distress.

Although sometimes organization members may decide that it is best to abandon the cause (eg. Dew, Goldfarb, & Sarasvathy, 2006), this paper explores how organizations can build resilience to adversity and learn to grow from the experience. Experiences of adversity are times when the organization can learn how to be more resilient in the future and this can involve harnessing the learning into a capability. Here, a view of organization resilience as a dynamic capability is developed, to steer decision-makers to new strategic incarnations of the firm as necessary.

Within management science, the topic of resilience has been indirectly addressed through literatures such as turnaround and dynamic capabilities. Others have been more direct in their use of the concept of resilience (Hamel &

Välakangas, 2003; Hayward, Forster, Sarasvarthy, & Fredrickson, 2010; Limnios, Mazzarol, Ghadouani, & Schilizzi, 2014; Sutcliffe & Vogus, 2003). However, in agreement with Limnios et al (2014), the conceptual development of resilience in organization science remains underdeveloped and what does exist is based on weakly-held assumptions about the nature of organizational capabilities. Valuable steps forward for the conceptual development of resilience as a dynamic capability can be made by incorporating the dimensions used in other disciplines where the construct has been adopted.

2.2 A MULTIDISCIPLINARY UNDERSTANDING OF RESILIENCE

In this section I briefly review literatures across the four domains of psychology, ecology, engineering and management science to distil key underpinning dimensions of the resilience construct. These four disciplines have been chosen because each exhibits significant extant literature developing the construct as it applies within each domain. The intention is to establish a foundation for defining and further developing resilience as it can be applied to organizations, to achieve a higher degree of operating reliability and performance across a range of fortunate and less fortunate circumstances that firms may confront (Weick & Sutcliffe, 2007). Table 1 highlights the differences in interpretation and between the three main types of resilience offered by the literature (from Martin & Sunley, 2015:4). Each of these disciplines are now explored, as they relate to the resilience construct.

Table 1: The three main types/definitions of resilience (Martin & Sunley, 2015:4)

Definition/type	Interpretation	Main field of use
Resilience as 'bounce back' from shocks	System returns, 'rebounds', to pre-shock state or path: emphasizes speed and extent of recovery	So-called 'engineering resilience', found in physical sciences, some versions of ecology; akin to 'self-restoring equilibrium dynamics' in mainstream economics
Resilience as 'ability to absorb' shocks	Emphasizes stability of system structure, function and identity in the face of shocks. The size of shock that can be tolerated before system moved to new state/form.	So-called 'extended ecological resilience', found in ecology and social ecology; akin to multiple equilibrium economics
Resilience as 'positive adaptability' in anticipation of, or in response to, shocks	Capacity of a system to maintain core performances despite shocks by adapting its structure, functions and organization. Idea of 'bounce forward'.	Found in psychological sciences and organizational theory; akin to 'robustness' in complex systems theory; can be linked with evolutionary economics.

Resilience in Psychology

Researchers and practitioners in this domain seek to understand why individuals and particularly children, experience “a *phenomenon or process reflecting relatively positive adaptation despite experiences of significant adversity or trauma. Resilience is a superordinate construct subsuming two key dimensions – significant adversity and positive adaptation – and thus is never directly measured, but is indirectly inferred based on evidence of the two subsumed constructs*” (Luthar, 2006: 742). In dealing with adversity, or the risk of confronting such adversity, some researchers in this domain have proposed that protective factors or assets need to be accumulated to offset the negative consequences or the risk of such consequences. Commonly, adaptation is measured in terms of the degree of competence in undertaking defined tasks against expected development milestones (see Masten & Obradović, 2006).

In this domain, researchers came to recognise that resilience is not fixed but changes with time and circumstances, following a developmental progression as new vulnerabilities and strengths emerge along this developmental path (Luthar, 2006). Accordingly, recovery from shocks and adversity in this domain is built on “*the mastery motivation system*” (Masten & Reed, 2002: 83) where not only skills at particular protective factors are built, but also adaptation to adversities that need to be navigated to effect recovery.

Masten (2007) proposes that the resilience construct in psychology has progressed through four stages of conceptual development. Firstly, the construct was framed as a trait based phenomena and researchers sought out characteristics that described resilient behaviours. These traits proved ambiguous in predicting future resilient adaptations. Secondly, researchers then began to explore the processes engaged over time in building a repertoire of resilient abilities. As in the first stage, the attempts to model the process of resilient development did not lead to strong predictive power. During the third stage, researchers attempted interventions to externally impact on levels of competence and wellness as well as seeking to steer away from looming risks where the individual appeared vulnerable to poor outcomes. The fourth and current stage by this schema sees researchers seeking to harness the potential unleashed by experiences in navigating adversities as a means of building individual resilience against future setbacks. The possibility of growth resulting from traumatic experience is captured through the notion of ‘bouncing forward’ (rather than bouncing back to an earlier condition) from adversity (Walsh, 2002).

Table 2: Conceptual Building blocks for resilience drawn from psychology literature

Conceptual Building Block from Psychology	Insight Development	Implication for Organizational Resilience
Resilience defined as “a class of phenomena characterized by patterns of positive adaptation in the context of significant adversity or risk” (Masten & Reed, 2002: 75)	<ul style="list-style-type: none"> Divides resilience framework into risks or threats to good adaptation vs protective factors and assets and the processes by which efficacy & motivation are enhanced 	<ul style="list-style-type: none"> Suggests that particular assets or attributes can be used to protect against known risks before those risks actually arise for the firm
Resilience “conceptualized as a dynamic process consisting of a series of ongoing, reciprocal transactions between child and the environment” (Vanderbilt-Adriance & Shaw, 2008: 31)	<ul style="list-style-type: none"> Focus on transactions with the external forces impacting on the individual, rather than patterns of adaptation as above 	<ul style="list-style-type: none"> Not so much an accumulation of assets and attributes, but the routines used in interacting with these resources that shape org resilience
“Few researchers now view children with positive outcomes as ‘invulnerable’ and there is increasing recognition that the effects of risk persist over time or emerge in unexpected ways” (Vanderbilt-Adriance & Shaw, 2008: 30-31)	<ul style="list-style-type: none"> Even though child may gain experience with a particular risk and achieve positive outcomes in navigating it, the effects persist, implying that a later adverse incident on the same risk could possibly result in negative outcomes 	<ul style="list-style-type: none"> Suggests that inoculation against future adversity is similarly unlikely in organization settings
“an understanding of the (resiliency) model accords choice and control” (Richardson, 2002: 311)	<ul style="list-style-type: none"> Reintegration after disruption requires the disrupted party to have the freedom to control their own choices of pathways forward 	<ul style="list-style-type: none"> Control of the firm needs vesting in the people who are navigating the adverse conditions, rather controlling parties external to these operational activities
“Resilient integration is to experience some insight or growth through disruptions” (Richardson, 2002: 312)	<ul style="list-style-type: none"> Which means growth of capability results from navigating adversity, as compared to pre-disruption levels 	<ul style="list-style-type: none"> Leadership mindset of embracing adverse conditions to enlarge organizational capabilities Capabilities develop through adversity
“(There exists) the tantalizing possibility that fundamental adaptive systems that develop within the individual child, once thought to be enduring attributes, may be ‘reprogrammable’ to a degree unimagined by the pioneers of resilience” (Masten & Obradović, 2006: 24)	<ul style="list-style-type: none"> Implies that ways of responding & adapting to adverse conditions can be re-learned and enlarged to achieve different outcomes 	<ul style="list-style-type: none"> Firms can teach resilience methods with values and behavioural cues that guide anticipation & containment of the consequences of adverse circumstances

Overall, research in the psychology domain is primarily concerned with the way individuals and communities respond to setbacks and to exploit “*regulatory capital*” to gain some level of protection from any inbuilt tendencies to adopt destructive behaviours (Masten, 2007: 926). Table 2 shows a summary of the conceptual building blocks of the construct.

Resilience in Ecology

Natural systems do not stand alone, independent from human activity, but represent a complex interaction between human decision making and ecological consequences. Human activities have led to such phenomena as global warming, pollution and landscape degradation. Consequently, research into the resilience of such landscapes and natural systems involves a socio-ecological mapping to understand the steps taken by humans that may have caused a particular outcome and, most importantly, the possible steps humans can take to either reverse this outcome (if undesirable) or at least achieve a further transition to a more desirable state than the one currently in place (for examples of such socio-ecological thinking, see Walker & Salt, 2006).

In ecological systems, resilience is a measure that indicates how large a disturbance can be absorbed before the system changes state, usually to a less desirable condition (Brock, Mäler, & Perrings, 2002). Understanding this state change requires appreciating the underlying slow changing variables that are hard to detect but, if correctly identified and managed, can lead to solutions to avoid or at least ameliorate undesirable consequences (Walker, Holling, Carpenter, & Kinzig, 2004). Detecting such impending regime shifts prior to

their occurrence offers the possibility of human intervention to avoid the change of state, if it is to lead to a less desirable condition (Biggs, Carpenter, & Brock, 2009).

A key contributor to resilient ecological systems is functional diversity (Folke et al., 2004). Such diversity can exist where different species or groups of species undertake different functions, so that the removal of just one species from the system can shift towards a change of state. Alternatively, the combination of diverse species may represent a diversity of responses to a range of adverse impacts indicating that a healthy and resilient system needs redundancy (that is, over-lapping functions) to avoid a possible change to a less desirable state when shocks are applied to the system. A summary of the conceptual building blocks of resilience in ecology is given in Table 3.

Resilience in Engineering

Engineering resilience applies to systems and the people that manage them, designed to operate to a reliable and stable pattern within a defined range of inter-dependent operating parameters. This means that an underlying assumption in this domain is that the model by which the system functions remains viable and purposeful over time, despite expected and unexpected perturbations that may impact on its operations. This also means that engineering resilience is concerned with monitoring the boundary conditions of the current model for competence (how strategies are matched to demands) and adjusting or expanding that model to better accommodate changing demands (Woods, 2006).

The primary focus is on maintaining system stability across a range of known operating conditions or the regaining of stability when conditions return to such a range. In addition, engineering resilience seeks to anticipate likely system responses if operating parameters fall outside these known conditions. In this context, the quest for stability of a system “*focuses on the behaviour of the system near an equilibrium point or trajectory, and can be measured by the speed at which the system returns to the stable point or trajectory following perturbation*” (Gallopín, 2006: 299). In this domain, adaptation to perturbations and adversities by a system requires that system to anticipate possible exogenous impacts and to at least issue some signal when those impacts cause or are about to cause performance of the system outside its defined patterns. The approach of the psychology research appears to seek an understanding of a person’s past to understand and inform their current state in relation to their environment, whether or not resilience to future set-backs may emerge. By comparison, engineering resilience is forward looking, seeking to alert emerging conditions that may cause the system to fail.

A number of models have been used to help visualise the processes at work in resiliently engineered systems. Most common are the cup and ball model, showing the state of a system relative to the equilibrium position of a single attractor, and the stress-strain state model, showing the progression stress levels in a system as the impact of perturbations increase over time (for an appraisal of such models, see Woods, Schenk, & Allen, 2009). In both models, an equilibrium state of optimal performance is assumed.

Table 3: *Conceptual building blocks for resilience drawn from ecology literature*

Conceptual Building Block from Ecology	Insight Development	Implication for Organizational Resilience
<p>“Managing for resilience focuses on system-level characteristics and processes, and the endurance of system properties in the face of social or ecological surprise” (Allen, Cumming, Garmestani, Taylor, & Walker, 2011: 337)</p>	<ul style="list-style-type: none"> • Leading a resilient system requires defined processes to work without interference • Focus on those processes that impact the viability or stability of the whole system 	<ul style="list-style-type: none"> • Encourages firm level development of positive impact resources and capabilities • Seeks to avoid micro-management of particular capabilities and resources
<p>Ecological resilience refers to the ability to recover from shock, not necessarily the speed of recovery (Walker & Salt, 2006: 63)</p>	<ul style="list-style-type: none"> • Resilience implies a focus on the ability to rebound, with recovery speed assumed to be sub-critical in most cases 	<ul style="list-style-type: none"> • In the process of recovering from shock, firms focus on re-assembling a stable resource set, taking time to re-establish inter-connections towards long term survival of the firm, even as a changed regime
<p>Redundancy increases adaptability of a system, while decreasing efficiency (Walker & Salt, 2006: 71) “A more efficient system is increasingly stable over a decreasing range of conditions” p77</p>	<ul style="list-style-type: none"> • Implies a trade off with efficiency (ie some level of redundancy & overlap) when resource depletion sets in, as a post shock resilience building approach • Deliberately reducing efficiency to gain such redundancy represents a counter-intuitive system management action 	<ul style="list-style-type: none"> • Capabilities that overlap by delivering similar outcomes under different conditions help to inoculate a firm against future shocks, albeit at the cost of decreased efficiency • The firm can prepare for anticipated adversities by building some select capability redundancies, even if specific resource attrition is not known in advance
<p>Biodiversity, in both functional-group and functional-response dimensions, aids ecological resilience (Folke et al., 2004: 570)</p>	<ul style="list-style-type: none"> • Resilience requires diversity of response to adverse events, coupled with a range of functional capabilities across resource types 	<ul style="list-style-type: none"> • Develop capabilities not only in expertise (ie function) but also to operate under various conditions (ie response context)
<p>Regime shifts entail changes in internal dynamics and feedbacks of an ecosystem that often prevent it from returning to a previous regime, even when the driver that precipitated the shift is reduced or removed (Biggs et al., 2009: 826)</p>	<ul style="list-style-type: none"> • If system changes prevent a return to a former regime, then the new regime needs to adapt, even when former regime exhibits more attractive elements • Inoculation implies controlling a key variable that drives a particular regime shift 	<ul style="list-style-type: none"> • Periods of growth & re-organization require implanting new capabilities to be implanted • Supports the outcome of a positive adaptation & growth as a consequence of navigating adverse events

<p>Undesired shifts between ecosystem states are caused by the combination of external forces and slow internal changes of the system (Biggs et al., 2009:826; Folke et al., 2004:567)</p>	<ul style="list-style-type: none"> • Detecting underlying variables that, if changed can trigger a threshold leap into another regime, underpins and evolving awareness of the impact of slow changing variables on the stability of the current regime 	<ul style="list-style-type: none"> • Focus on slowly changing variables within the firm & the conditions that may cause unexpected reactions to external shocks • Slow changing parameters are best addressed early in their cycle, often before they have become significant in their impact on the firm. This implies wide ranging control by key decision makers
<p>Feedbacks play a large role in maintaining or reducing system cohesion and can push the system over a threshold (Allen et al., 2011:343)</p>	<ul style="list-style-type: none"> • Maintaining a feedback loop assumes knowledge of key variables that impact system operation and detecting variable changes 	<ul style="list-style-type: none"> • Diverse tightly-coupled and loosely-coupled feedback loops enhance firm resilience
<p>Resilience is the distance of an existing state to a threshold of change into another regime (Walker & Salt, 2006: 74)</p>	<ul style="list-style-type: none"> • Sensing distance in ecological “basins” assumes knowledge of detecting & measuring relative variable states 	<ul style="list-style-type: none"> • Specific management of a state can enable the firm to choose to deliberately remain close to a threshold condition, ready to change regimes should a strategic context arise, into a more attractive state

Table 4: *Conceptual building blocks for resilience drawn from engineering*

Conceptual Building Block from Engineering	Insight Development	Implication for Organizational Resilience
<p>Resilience does not equate to reliability. Reliability is focussed on reducing the probability of failure in defined operating frameworks of high reliability organizations (Weick & Sutcliffe, 2007); resilience is focussed on recovery from irregular variations (Nemeth, 2009: 3)</p>	<ul style="list-style-type: none"> • Highly reliable organizations focus on mindful systems awareness (focus on failures, reluctance to simplify, sensitivity to operations, deference to expertise) • Resilience focus on navigating unstable operations in unstable conditions; built by practised adaptation to irregular variations • Resilience building requires different but complementary strategies to reliance building 	<ul style="list-style-type: none"> • Various staff resources have differing interpretations of the way to solve unreliable, ie unstable systems attempting to re-build after decline. A few or a single key decision maker with clear and wide ranging control need to detect small emerging failures & impose solutions towards operating stability • Risks reducing feedback sensing if this judgement fails to drive increased operating stability, assuming alternatives courses of action are available
<p>“... depending on their level of resilience capacity, (firms can) potentially become more hardy and capable as a consequence of effectively responding to disruptive shocks” 3)(Lengnick-Hall & Beck, 2009: 43)</p>	<ul style="list-style-type: none"> • Again, implies resilience can be built through a practiced repertoire of adaptation to irregular variations/disruptive shocks 	<ul style="list-style-type: none"> • Requires sufficient operational & political control to attempt variations to historical responses to adverse events – a capacity to try & perhaps fail & try again
<p>“the parameters of Holling’s ecological systems and ball & cup models are essentially the same and only characterise a system’s base adaptive capacity (whereas the) stress-strain state space is a broader characterization of a system’s different adaptive capacities and the transitions between them” (Woods et al., 2009: 74)</p>	<ul style="list-style-type: none"> • Resilience transforms with context and changing conditions and this transformation can perhaps be guided if the correct variables are manipulated • Stress strain state system assumes linear path-dependency beyond base adaptive capacity, disallowing foresight to anticipate future strains in response to stresses and resilience inoculations that can be installed 	<ul style="list-style-type: none"> • Firm response changes when stressed and key decision makers seek to select the best time to restructure firm & response routines to avoid fracture/collapse • Suggests an integration of resilience with operating reliability may be possible across a wide range of conditions

<p>“Vulnerability is something that lengthens or shortens the vertical line on the recovery delta ... because the angle ... is what determines the time to full recovery” (Birkland & Waterman, 2009: 27)</p>	<ul style="list-style-type: none"> • Emphasis on speed of recovery from damage to pre-disaster infrastructure performance as a key measure of system resilience, as greater recovery time indicates lower resilience, even if the same level of vulnerability applies • Return to normalcy seeks to avoid re-establishing earlier levels of vulnerability 	<ul style="list-style-type: none"> • Can only seek to reduce vulnerability when exposures are known • In uncertain climates, enlarge capabilities to respond to & contain shocks, even if such response takes time, rather than consume resources anticipating possible setbacks, some of which may not eventuate
<p>“Managing the unexpected consists of extrapolating the possible effects of small discrepancies, imagining scenarios not yet experienced, hypothetically constructing alternative lines of action and envisioning what might have been overlooked given the narrow focus of a set of expectations” (Weick & Sutcliffe, 2007: 159)</p>	<ul style="list-style-type: none"> • Requires a culture of mindful awareness of alternatives and so learning & adapting to unexpected events and embracing failures • “reliable outcomes require the capabilities to <i>sense</i> the unexpected in a <i>stable</i> manner and yet <i>deal with</i> the unexpected in a <i>variable</i> manner” (p67) 	<ul style="list-style-type: none"> • If alternative action is not possible, the firm’s members can only persevere with the course or surrender • Times of strategic & resource collapse force the creation or consideration of opportunities that otherwise get ignored
<p>“Resilience is the capability of a system to maintain its function and structure in the face of internal and external changes and to degrade gracefully when it must” (Weick & Sutcliffe, 2007: 69)</p>	<ul style="list-style-type: none"> • System can still operate even when parts of it may fail to function 	<ul style="list-style-type: none"> • Firm seeks to identify central qualities that slow degradation or present the capability to renew growth trajectory

The other key concept behind engineering resilience is the speed of recovery from perturbation, with higher speed of recovery more desirable. Speed of response is not a critical factor in either psychology or ecology domains. A summary of the conceptual building blocks of engineering resilience is shown in Table 4.

Resilience in Organization Science

Organizational resilience as a positive adjustment to challenging conditions conceptualises responses as either resilient (being more likely in the presence of enabling conditions) or rigid (being more likely in the absence of enabling conditions) (Sutcliffe & Vogus, 2003). Such a construct yields two possible consequences to threats of either positive or negative adjustment. The ability to learn from mistakes and to quickly process feedback are highlighted but the actual core requirements for building a resilience capability in a firm that currently doesn't possess such capability remains unclear. Learning under conditions of ambiguity, where causation between events are inferred from individual beliefs, individual actions and resulting organizational actions, requires trusting relationships between key actors within the firm (March & Olsen, 1975).

Also undefined are the dynamics of capability adjustments over time under different contexts of threat response. Further, the conditions when the firm may be capable in terms of achieving some level of performance to meet its objectives yet possesses unstable resources remains unexplored. I argue that it is the condition of strategic failure combined with deep resource loss where

resilience is most required. Consequently, building adaptive agility under stressed circumstances is of key importance.

Dynamically re-inventing business models and strategies as circumstances change may sound straight forward (Hamel & Välikangas, 2003) but such re-invention may not be possible. Firms face many competing or incompatible strategic forces with unknowable consequences; incorporating these forces in a climate of uncertainty requires more than just a desire for renewal. Renewal as a response to hard times can lead to a series of constantly changing short-term fixes for a cascade of emerging issues and crises.

Schemes for building organizational resilience have been outlined, covering management of a sub-set of assets being human resources (Lengnick-Hall, Beck, & Lengnick-Hall, 2011), a focus on cognitive frameworks for adapting to environmental conditions (Watts & Paciga, 2011), a focus on reducing vulnerabilities by reducing the propensity to disruptive events (Sheffi, 2005) and the desirability of various dynamic states (Limnios et al., 2014). Further, learning mechanisms derived from routine actions serve as a means to incorporating individual skills into collective actions (Levitt & March, 1988). Taken together, none of these frameworks give an empirically grounded basis to build robust resilience capabilities that can be applied to a firm across a range of conditions. Organizational resilience can be appreciated in comparison with other domains, with Table 5 showing key parameters across the four disciplines. This table expands and validates the distinctions drawn in the definitional Table 1 (Martin & Sunley, 2015).

Summary of Multidisciplinary Review

Organizational learning underpins the development of resilience within the firm and draws on the classical observations that learning is enacted through routines, which are history-dependent and oriented toward specific targets (Levitt & March, 1988). Indeed, while “*organizations are intendedly rational, they frequently act on incomplete or incorrect information without being aware of all their alternatives*” (March & Olsen, 1975: 148) thereby paving the way for consideration of heuristic as opposed to routine capabilities.

Table 6 summarises the key parameters across the four domains, highlighting the underlying assumptions and arising gaps for each space. Tables 7 and 8 map the key underlying assumptions with related constructs across each domain, which can be incorporated into developing the construct for organization science application. Two key insights emerge from these tables.

Firstly, in complex real-world environments, complete and rational cognition is rarely plausible so that some information must be overlooked by adopting simple rules that enable quick and accessible decision making when resources are stressed or collapsing. By ignoring some information, an effective heuristic allows the key principles of interest to gain nearly full attention providing a cycle of learning occurs that builds the performance of successive adaptations.

Table 5: A comparison of key parameters of resilience across the four domains

Parameters	Psychology	Ecology	Engineering	Organizations
Dominant Logic	Threats & hazards as a disruption to individual function & development, requiring adjustment & adaptation to regain positive achievement (Masten & Reed, 2002)	The capacity to absorb shocks and to still maintain function (Walker & Salt, 2006) Disturbance that can be sustained before change in system regime (Holling & Gunderson, 2002)	Recovery to normal function after irregular variations (Nemeth, 2009) System degrades gracefully if it cannot regain normal function (Allenby & Fink, 2005)	Capacity for continuously dynamic reconstruction of business models & strategies as circumstances change (Hamel & Välikangas, 2003)
Metaphor adopted	Resilient re-integration of capabilities after disruption, seeking to regain or exceed previous performance levels (Richardson, 2002)	Manage slow moving variables that act to shorten the distance to a change threshold (Walker et al., 2004)	Barriers to both disruption from hazards & propagation of consequences (Hale & Heijer, 2006)	Resilience allows a rebound from adversity, strengthened & more resourceful (Sutcliffe & Vogus, 2003)
Alternative metaphor	Protective factors to offset vulnerabilities & stressors (Masten & Obradović, 2006)	Negative regime shifts follow loss of functional diversity, while positive transformations require active adaptive management (Folke et al., 2004)	Ability to continuously steer activities close to danger yet avoid disaster (Hale & Heijer, 2006)	Whereas fragile systems seek stability & robust systems seek to return to normal function, anti-fragile systems thrive on volatility (Taleb, 2012)
Operating framework	Multilevel process analysis & adaptation dynamics (Masten, 2007)	Ability to recover from shock in a complex adaptive system, not necessarily the speed of recovery (Walker & Salt, 2006)	Time yields evolution of complexity, resulting in a more robust system (Klein, 2012)	Complex adaptive systems with embedded propensities to integrate to emerging contexts via technical/systematic/systemic/ unitive leadership styles (Watts & Paciga, 2011)
Antecedents	Accumulate protective factors to reduce vulnerabilities to future disruptions & grow competence (Masten & Obradović, 2006)	Redundancy increases adaptability of an ecological system, while decreasing efficiency (Walker & Salt, 2006)	Readiness, response & recovery require capabilities of control, coherence & connectedness (Ponomarov & Holcolmb, 2009)	Reducing vulnerability to high impact/low probability disruptions improves responses to more regular operating fluctuations (Sheffi, 2005)

Table 6: Reviewing each domain to identify gaps for further analysis

Parameter	Psychology	Ecology	Engineering	Organizations
Typical Definition of resilience	positive adaptation despite experiences of significant adversity or trauma (Luthar, 2006: 742)	capacity of a system to absorb disturbance and still retain its basic function & structure (Walker & Salt, 2006: xiii)	monitoring & adjusting system performance to accommodate changing demands (Woods, 2006: 22)	a firm's ability to effectively absorb, develop situation specific responses to, and ultimately engage in transformative activities to capitalize on disruptive surprises that threaten organizational survival (Lengnick-Hall et al., 2011: 244)
Key Dimensions	protective assets; vulnerability to risk factors	Distance to state-change thresholds; slow changing variables	Speed of recovery from shock; attraction to a stable state	Adaptive capacity to mediate risks
Unit of analysis	Individual, families or communities, even national populations; usually under stress	Specific landscapes or entire ecological systems comprising multiple landscapes	Stable systems usually with a single attractor	A business preparing for or navigating adverse conditions
Major Insights	Maps dynamics of risk, assets, vulnerabilities & protections (Masten, 2007: 927)	Functioning diversity supports resilience rather than stability (Brock et al., 2002: 272);	Future looking to assess capability of a system to continue to function, even outside designed operating parameters	Diversity of skills allows dispensing of constraining routines and creation of new competencies (Watts & Paciga, 2011) Reducing vulnerability reduces outcome risk (Sarewitz, Pielke Jr, & Keykhah, 2003: 809)
Gaps	Focus on individual & immediate environment rather than creating qualities that elicit desired environment	How to achieve transformations to new & sustainable stable states (Walker et al., 2004)	Assumes an equilibrium state for optimal performance, and so recovery from shock rather than performance enhancement	Dynamics of enabling org resilience building following high impact events currently unexplored (Burnard & Bhamra, 2011: 5595)

Table 7: Key underlying assumptions for resilience across the four domains

Key Assumptions	Psychology	Ecology	Engineering	Organizations
Traits, phases & path attributes	<p>Process focus on building adaptive response sequences to adversity (Luthar, 2006)</p> <p>Trait focus on genetic & emotional attributes that protect against target stressors (Luthar, 2006)</p>	<p>4 stage adaptive cycle: growth-conservation-release-reorganization (Walker & Salt, 2006)</p> <p>Change is episodic, spatial attributes are discontinuous & ecosystems sustain multiple scale-dependent equilibria (Holling & Gunderson, 2002)</p>	<p>Resilience is the ability to adjust functioning prior to or during an event to maintain function along with a process of monitoring performance to confirm the suitability of such adjustment (Hollnagel, 2009)</p>	<p>Resilience requires strategic agility to exploit unexpected opportunities (Lengnick-Hall & Beck, 2009)</p>
Specific & general characteristics of change	<p>Adaptations to specific adversity require a specific competence; composite (ie global) protections indicate variance in adaptation paths & outcomes (Luthar, 2006)</p>	<p>Optimising parameters to achieve a specific goal increases stability over a decreasing range of conditions (Walker & Salt, 2006)</p> <p>Need to differentiate behavioural (impacting vulnerability) from structural (impacting resilience) change (Gallopín, 2006)</p>	<p>Resilience engineering grounded in actual experience & imagined possible states – a collection of specific adjustments in adapting to envisaged disruptions (Nemeth, 2009)</p>	<p>Not all agile firms are resilient – determined by nature of environmental shifts each org capability is designed to address, implying a specific focus for each capability (Lengnick-Hall & Beck, 2009)</p>

How routines are coupled	Adapting most salient individual tasks for a given developmental period – indicating different routine requirements at different stages (Egeland, Carlson, & Sroufe, 1993: 525)	Slow changing variables, often unnoticed, impact on routines that control proximity to thresholds – left unaltered, resilience degrades (Walker & Salt, 2012: 161, 193)	Resilience capacity couples with & moderates strategic agility re future performance (Lengnick-Hall & Beck, 2009: 66). Routines to mitigate disasters can be project (building things) or process (policy tools) based (Birkland & Waterman, 2009: 30)	Loosely coupled org systems are less efficient but more adaptive to delays & unforeseen changes, although linkages & consequences can be obscure (Stacey, 2003)
Building resilient capabilities before adverse impacts	Relationship quality, particularly within an enduring proximal circle, a key protective mechanism to enable growth through disruptions (Egeland et al., 1993; Luthar, 2006)	Define critical indicator levels & rapid response to these levels rather than simply detecting change in particular levels (Biggs et al., 2009)	Develop cognitive, behavioural & contextual dimensions of resilience capacity to enhance strategic agility when disruptions arise (Lengnick-Hall & Beck, 2009: 44)	Improving general overall capability to be vitally prepared for adversity (Sutcliffe & Vogus, 2003) Optimisation assumes no fundamental change in outputs – disruptions change such underlying requirements (Hamel & Välikangas, 2003)
Key characteristic to enable performance growth	Risk modifiers generative of other assets, catalysing strengths & mitigating vulnerabilities (Luthar, 2006)	Sufficient control to focus on attributes exhibited in the back loop (release-reorganization) to increase adaptability & make thresholds more distant from current state (Walker & Salt, 2012)	Preparedness for future adversity key characteristic to hasten recovery – engineering resilience does not embrace concept of improved performance, but recovery to prior performance levels (Birkland & Waterman, 2009: 29)	Anticipate change (through failure focus, complex analysis & operational sensitivity) and contain consequences (through improvised workarounds that defers to expertise) (Weick & Sutcliffe, 2007) Small changes in initial conditions can lead to large unexpected outcomes, desired or undesired (Plowman & Duchon, 2008)

Table 8: Constructs related to resilience capability across the domains

Related Constructs	Psychology	Ecology	Engineering	Organizations
Adaptation	Focus on individual, family unit or community group coping with & adapting to stressors & shocks	Focus on thresholds & conditions that will lead to crossing them into a changed (assumed less desirable) regime state (Walker & Salt, 2012)	Change designed boundaries of system operations, to cover wider/changed set of possible conditions yet maintain desired function (cf. Walker & Salt, 2012: 145)	Flexibility, agility & adaptability are configured to achieve org purpose & identity in dynamic climates (Lengnick-Hall et al., 2011)
Evolution	Growth of psychological traits & processes (including resilience) measured against identified developmental stages – an average metric across populations	Resilience depends on functional diversity of species that support critical structuring processes (Brock et al., 2002: 272)	Focus of eng resilience is on system stability whereas evolution focus is on growth & change of a system as it adapts to an (implied, stable) environment or set of states	Symbolic-interpretivism & complexity thinking (Houghlum, 2012) operating near edge of disintegration learn faster than in a stable zone (Stacey, 2003: 256)
Learning from failure	Adapting to new conditions but also reintegrating a more robust capability because of adversities, not in spite of them (Richardson, 2002)	Little focus on reverting to a previous, considered more desirable, state – less learning than coping with new state conditions	Recovery from shock can embrace a transition to a new desirable state through human interaction in design (Smith, Spencer, & Billings, 2008: 150)	Build a variety of possible, workable states through diverse & efficient adaptive resources and org cohesion (Bhamra, Dani, & Burnard, 2011)
Acquiring resources	Overcome liabilities or reduce vulnerability to future shocks by external interventions – focus on positive relationships & personal control (Luthar, 2006)	Resources made available exogenously to a particular state & exploited by that state – implies event opportunism (Holling, Gunderson, & Ludwig, 2002: 14)	Systems prone to mitigate future disasters through engineering resources than collective changes in behaviour (Birkland & Waterman, 2009: 29)	Invest in capabilities & their requisite resources that yield greater flexibility to manage anticipated uncertainties (Maritan & Alessandri, 2007)

Options & Bricolage	Resources needed for adaptive implementation shaped by self-efficacy (Brown & Westaway, 2011: 325)	Seek alternative stable states to guide variable selection & so define options for change (Holling & Gunderson, 2002: 36)	Encourage diversity in design process & options to gain robustness in function & redundancy of systems (Walker & Salt, 2012: 153)	Create options through trial & error, making do by recycling resources that would otherwise be wasted (Taleb, 2012: 181)
Change & conflict	Shape resilience by interactions of multilevel dynamics – an adaptive systems approach to change emphasising regulatory capital (Masten, 2007: 926)	Change enhances resilience – resisting change increases vulnerability (Walker & Salt, 2012: 24)	Event readiness assumes a complete mapping of system attributes & performance to render efficient response to disruption (Ponomarov & Holcolmb, 2009)	Cybernetic views seek to avoid conflict & plan change whereas emergent views embrace conflict as an accompaniment to change (Plowman & Duchon, 2008)
Heuristics	Efficient cognitive processes that ignore information (Gigerenzer & Brighton, 2009)	A handful of heuristics aid help understand resilience of social-ecological systems (Walker et al., 2006)	Analyzing disruptions allows resilience principles & heuristics to be built through anticipation, learning, recovery & adaptation (Madni & Jackson, 2009)	Fast & frugal heuristics provide robust strategies to perform well under uncertainty (Mousavi & Gigerenzer, 2014) Org heuristics relate to the strategic logic of opportunity (Bingham, Eisenhardt, & Furr, 2007)

Secondly, the ability to undertake such adaptation is central to a system's resilience capability suggesting that, in the organizational sense at least, the ability to sense the need for change then to corral the resources necessary to enact the transformation form a central component of a resilient firm. Other techniques such as bricolage, resolving conflicts, learning and evolution can be used at different times, depending on the adversities the system is encountering and the resources it can access.

Since the ongoing performance of firms under dynamic conditions requires continual balancing (and rebalancing) of structure against flexibility responses (Eisenhardt, Furr, & Bingham, 2010) so too this summary highlights that resilient systems must balance agile adaptation with efficiency. This suggests a tension between routine actions and adhocery (Teece, 2012).

2.3 THE LINK WITH DYNAMIC CAPABILITIES RESEARCH

Consequently, the process model of resilience embraces similar tensions to the dynamic capabilities view in organization science. Responses to adverse or traumatic events generally require a reconfiguration of existing resources or activity sequences. Dynamic capabilities are generally construed as higher-order processes for reconfiguring resources and associated operating routines in changing environmental circumstances to yield sustained competitive advantage (Burnard & Bhamra, 2011: 5595).

A disruptive innovation for instance can cause a firm to go into decline if it was unprepared for the strategic shift (Eisenhardt & Martin, 2000; Peteraf, Di

Stefano, & Verona, 2013; Teece, Pisano, & Shuen, 1997). Dynamic capabilities must be developed to handle the resulting disorganization and re-steer the firm to strategic renewal. Such capabilities also must be committed to organizational memory in the form of routines (or perhaps simple rules, that is heuristics) in order to be available again in circumstances of disruptive innovation (Danneels, 2010). In Richardson's (2002) psychology process model, this learning and institutionalization of the capability is akin to resilient reintegration as the firm learns to cope with such adversity and make such learning beneficially available to future occurrences. In the setting of the firm navigating such disruptions, *"learning includes both the processes by which organizations adjust themselves defensively to reality and the processes by which knowledge is used offensively to improve the first between organizations and their environments"* (Hedberg, 1981: 3).

In addition, Teece (2007) describes dynamic capabilities as possessing three main processes of sensing, seizing and transforming. These three processes align with intervention points for building a capability in resilience before (sensing), during (seizing) and after (transforming) adversity. The dynamic capabilities framework therefore offers promise in accommodating the assumptions learned about resilience in psychology research and providing a platform for the building of a robust foundation for organizational resilience conceptualization.

Dynamic capabilities are relevant to circumstances that are fluid, uncertain and unpredictable. In such circumstances, dynamic capabilities take

the form of heuristics, providing cognitive shortcuts in decision making, particularly in uncertain, limited information contexts (Peteraf et al., 2013) so allowing faster action where speed of response is a critical criterion. In his seminal work on uncertainty, economist Frank Knight (1921) demonstrated how risk differed from uncertainty (Bingham & Halebian, 2012; Mousavi & Gigerenzer, 2014). Whereas risk is a phenomenon addressed by considering probabilities, uncertainty is a phenomenon addressed by frugal rules or heuristics (Knight, 1921).

The 'simple rule' form of a heuristic lays down some cognitive and behavioural parameters without over-prescribing action sequences such as in routines. Routines are different to heuristics in that the former are detailed steps for narrow problems whereas heuristics apply to a range of similar problems without behavioural detail (Mousavi & Gigerenzer, 2014). Davis, Eisenhardt & Bingham (Cohen, 2012) showed that heuristics can be viable in predictable environments and vital in volatile ones, thus indicating a wider effectiveness of heuristics in strategic decision-making than often assumed. Bingham & Halebian (2012) found that firms can develop heuristics from negative outcomes particularly when their attributions converge across organizational levels concerning the causes of those negative outcomes. Linking with Teece's (2007) framework, how can heuristics guide processes of sensing, seizing and transforming before, during and after adversity?

2.4 A PROCESS-BASED MODEL OF ORGANIZATIONAL RESILIENCE

Psychology is the only domain to highlight the idea of resilient reintegration (Richardson, 2002); that is, a positive adaptation to adverse conditions so as to achieve levels of performance higher than would have been achieved absent the adversity. Expanding this construction, Figure 1 incorporates a range of criteria to classify and distinguish a process model of resilience across dimensions of threats and disorganizations as these may impact on a firm after trauma. These dimensions, drawing on earlier tables, are important antecedents to the firm's ability to respond to adversity and prosper.

Threat Dimensions

Threats can differ in terms of *severity*, meaning the extent to which they can threaten the existence of the firm. In some cases, for example, technological change can cause significant disruption and demise to incumbents¹ (Davis, Eisenhardt, & Bingham, 2009). Threats can also be distinguished in terms of the scale and scope of response required to meet the multidimensionality of the threat. *Complex* threats implicate numerous organizational sections and entail more extensive coordinated responses. Product recalls following threats to public safety are an example. Threats can also be *catalytic* as they trigger a ripple effect of other threats. The loss of a key customer, for instance, can cause consequent investor and staff withdrawal. The *frequency* with which particular

¹ A key issue here of course is whether a valid threat is in fact perceived that way (Levitt & March, 1988). I leave aside perception limits to focus on the objective properties of threats.

threats strike the firm can also be debilitating through attrition and compounding effects. Finally, the *familiarity* of a threat to the firm is also determinative of the firm's ability to handle it, with new and unfamiliar threats sparking non-routine (and therefore unproven) responses and a higher likelihood of disorganization.

The extent of a threat's severity, complexity, catalysis, frequency and familiarity is also firm-specific with firms differing across a profile. For example, in general terms and faced with the same 'threat', start-ups may face a different profile across the threat classification criteria than a large incumbent. Within-group differences will also occur as firms have different past experiences and different resilience capabilities, leading to different threat classifications and effects. For any one firm, threats are regarded as high risk when they have the potential for serious disorganization.

Interaction effects between the different characteristics of threats points towards a decision context where heuristics and behavioural flexibility are required in dynamic capabilities for resilience. Also, faced with different threat profiles firms will develop heterogeneous portfolios of rules to cope and respond, attesting to the state of their resilience capability.

Disorganizations

Specific threats require specific types of resilience. Figure 1 shows that threats can trigger disorganization which, in an organizational setting, is a loss of reliable positive outputs from routines of action. Further, different threat profiles in terms of severity, complexity, catalysis, frequency and familiarity can lead to

different types of disorganization experienced by the firm. An important lesson from psychology is the need to classify these different types of disorganization if we are to better understand how firms build resilience against specific threats and disorganizations.

In this chapter, different types of disorganization are classified according to type and complexity, with three main types being strategic, operational and resource². Strategic disorganization can occur following such threats as technological obsolescence, competitor countermoves, competence-destroying disruptions, and product failure. Strategic disorganization can be characterized by the entering of a strategic vacuum as the generic strategy collapses, competencies are made irrelevant and key product-market strategies fail.

In addition, there may be considerable fallout and dissension among the principal decision makers contributing to a lack of coherence about the future strategy. Operating disorganization can be characterized by gaps arising in operating routines so that regular coordinated collective actions do not reliably deliver positive outcomes for the firm. Resource disorganization is characterized by loss of control or access to resources in the short term meaning strategic outcomes cannot be reliably achieved and that new approaches will be required to form stable opportunities for the firm.

Resource disorganization occurs when key resources become both unavailable and difficult to access in the near-term making the firm unable to

² These three types of disorganization correspond to the turnaround tripod – the three common areas of focus for turnaround efforts (Shein, 2011)

sustain its strategic and operating objectives. Staff may leave the firm and/or be poached, lenders become unprepared to extend uncollateralized loans, loan defaults worsen credit ratings and make further finance difficult, investors withdraw, key customers and suppliers collapse, and/or key strategic assets are rendered mute. Further, the firm's income streams reverse and are unable to cover debt and provide the positive cash flow for needed working capital to sustain assets and operations.

Any disorganization is likely to have an adverse effect on other parts of the organization and thus possibly trigger further disorganizations. To an extent then the different types of disorganization overlap. However, consistent with the general finding in psychology that specific threats require specific resilience, each disorganization can entail distinctive remedial actions. That is, a distinct dynamic capability is required to address each disorganization.

When firms face just a single form of disorganization we call this a singular disorganization. However, ensuing multiple disorganizations are referred to as a complex disorganization. This distinction between singular and complex disorganizations has implications for firm responses through different dynamic capabilities.

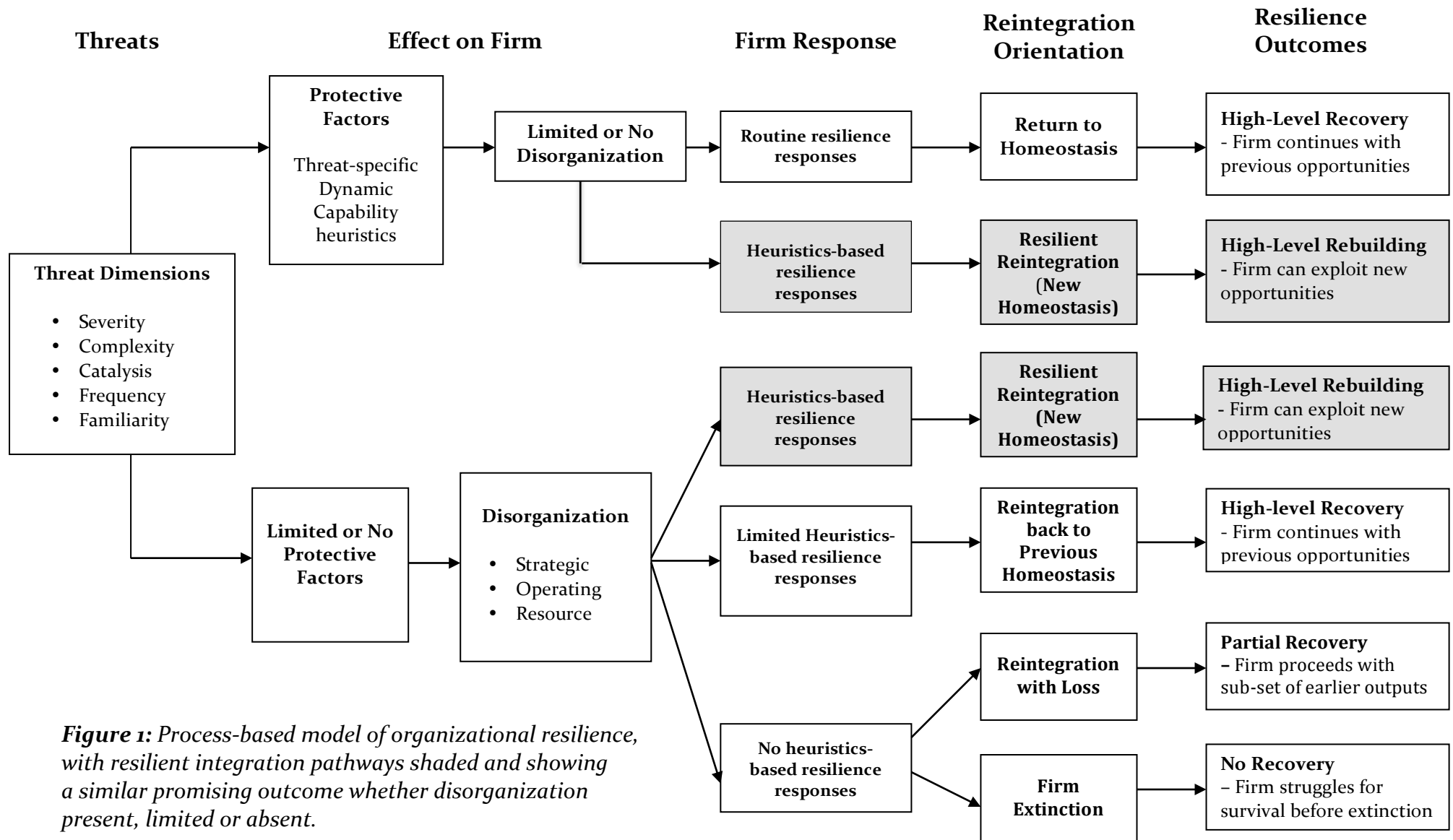


Figure 1: Process-based model of organizational resilience, with resilient integration pathways shaded and showing a similar promising outcome whether disorganization present, limited or absent.

2.5 RESILIENCE RESPONSES, ORIENTATIONS AND OUTCOMES

Firms undergoing disorganization have an opportunity for growth through expansion of the firm's resilience repertoire. Yet firms can choose different ways of processing the threat, whereby a disruptive event is followed by reintegration (Christensen, 1997; Tripsas & Gavetti, 2000). At the individual level, people are capable of choosing the psychological outcomes of disruptive events. According to Richardson (2002), disorganizations mean that an individual's world paradigm has changed, possibly expanded (post-adversity). Eventually the person must ask how they are going to overcome this serious disruption, which invokes the process of reintegration.

Reintegration is the process of incorporating a trauma into a resilience repertoire that enables rebuilding with stronger resistance and more tools to navigate future adverse episodes. As indicated in Figure 1, firm responses to threats and disorganizations can range from no reintegration leading to firm extinction, partial reintegration which leads to a recovery to performance levels lower than the previous homeostasis, reintegration back to homeostasis or resilient reintegration which is the most mindful reintegration orientation. Resilient reintegration is a deliberate approach to building resilience characterized by not only recovery but also attempts to build new rules and action sequences which may enable a level of post-disorganization performance higher than the previous homeostasis. This resilient reintegration captures the idea of resilience being a growth experience.

Also, different resilience outcomes emerge from how firms configure their responses and orientations. Firms that use particular heuristics or routines with a resilient reintegration orientation position themselves to be able to exploit new opportunities beyond the former set they were pursuing. In contrast, firms without such a resilient reintegration orientation are more focused on returning to homeostasis and thus their resilience outcome is more about the re-pursuit of former opportunities. Their resilience orientation has not permitted the larger growth process inherent to resilient reintegration.

The key assumptions in Table 7 hint at an efficiency/flexibility trade-off in resilience responses, a trade-off well recognized in organization research (Eisenhardt et al., 2010). Figure 1 shows that when threats cause little to no disorganization then the firm may deploy routinized resilience responses. Such responses will maximize efficiency through local search for solutions (Flach, 1997). The resilience orientation is one of return to homeostasis where the firm is merely trying to overcome the disruption and restore former circumstances. Here, learning for a broader resilience repertoire is limited. Alternatively, and as shown in Figure 1, the firm may use the experience of mild disruption for greater resilience learning. This is coupled by an orientation towards resilient reintegration, a wider search for solutions and greater cognitive and behavioural flexibility.

These flexibilities are indicated by the range of constructs listed in Table 8, including evolution, adaptation, bricolage and heuristics. As disorganization becomes more substantial there is greater resource loss and so routine

responses become unavailable. Heuristics-based responses predominate. These allow wide search and cognitive and behavioural flexibility to identify new solutions from a resilient reintegration orientation (March, 1991). Firms are now using a resilience mindset to reinvent the firm beyond former homeostasis. Taken together, these arguments contend:

Proposition 1: *Firms that deploy routine-based resilience responses are more likely to return to homeostasis rather than resilient reintegration. The primary mechanisms are routines, efficiency, local search and homeostasis.*

Proposition 2: *Firms that deploy heuristics-based resilience responses are more likely to aspire to resilient reintegration than homeostasis. The primary mechanisms are heuristics, flexibility, wide search and resilient reintegration.*

The advantage of heuristics is that they minimise the requirements for cognitive resources to every emerging problem, allowing selected evidence or cues to quickly indicate the rule to be applied and so ignoring large swathes of irrelevant information to yield desired results (Bingham & Eisenhardt, 2011). By ignoring this irrelevant information or noise, heuristics assume an underlying evolved capacity to interpret the context for particular cues and the subsequent rule selection for the problem to hand. Such fast and frugal decision making yields flexibility in application in achieving positive outcomes but assumes an often tacit disposition in the way contextual factors are interpreted and noise overlooked. Such contextual disposition is referred to as ecological rationality

(Gigerenzer & Gaissmaier, 2011) and is the key predictor of when particular heuristics will fail or succeed. Accordingly, heuristics are best employed to facilitate rapid and flexible decision making under conditions of uncertainty, when the pathway to desired outcomes are undefined due either to resource collapse or transience (that is, unreliable or unstable availability). This means that new opportunities can be formed and tried quickly without high decision making overheads, yielding strategic and operating agility. Heuristics are less well suited to conditions of certainty of resource availability because ignoring information is likely to decrease efficiency of attaining desired goals, unnecessarily increasing operating overheads. Accordingly:

Proposition 3: *The greater the uncertainty and resource loss from disorganization the more the firm will use heuristics-based dynamic capabilities for resilience.*

In a related vein, routines apply recurrent behaviour patterns to derive an advantage from particular conditions, on the basis that historically such recurrent action sequences have yielded the desired results (Gigerenzer, 2008). When such adopted routines reliably yield positive results they are termed a capability (Teece, 2012). Like heuristics, routines are a behaviour pattern that seek to lessen the uncertainties of complexity and tension between organisational units when conditions of resource certainty exist. Unlike heuristics, however, routines strive for the efficient exploitation of the available resources in achieving desired objectives. By way of a boundary condition, “*a more efficient system is increasingly stable over a decreasing range of conditions*”

(Walker & Salt, 2006: 77). This implies that a more efficient system is less resilient to disruption across its operating range. Accordingly:

***Proposition 4:** On average, the flexibility-orientation of heuristics increase resilience across a greater range of adverse situations than the efficiency-orientation of routines.*

2.6 HEURISTICS-BASED DYNAMIC CAPABILITIES FOR RESILIENT REINTEGRATION

This background supports a contention that resilient reintegration and reintegration back to homeostasis involve applying heuristics from a learned repertoire that facilitates dynamic resilience capability development. Resilience against strategic disorganization requires a distinct dynamic capability versus operating and resource disorganizations and vice versa. Generically though, resilient reintegration requires each dynamic capability to involve three processes: sensing, seizing and transforming. We discuss each in turn.

Sensing

Teece (2007) frames the sensing function of dynamic capabilities from an opportunity perspective. That is, sensing is a primary activity set involving scanning for and recognising possible growth options and then proceeding to interpret, create, learn and shape new opportunities (Teece, 2012). A resilience perspective calls for also being able to ‘sense’ when trouble is impending and take preparatory action.

Seizing

Seizing involves catalyzing the organization response to the sensed threat and resulting opportunity. Here again, the firm's resilience orientation is determinative. If the resilience mindset is one of return to homeostasis post-disorganization, then seizing is undertaken in a way that seeks to minimize damage from the threat and get the firm back on track. But a resilience orientation of reintegration engages a deeper learning process with a view to 'future-proofing' against similar threats that may arise. Here seizing attempts to minimize damage by actors are not bound by the limited perception of the firm returning to its former state. Seizing from a reintegration resilience orientation uses learning to embed future access should similar threats be encountered again. But also, seizing is open to the possibility of larger organizational change and response as sense is made of threats in a way that can re-define the firm's opportunity set. Seizing is thus part of a growth process in response to adversity.

Transforming

Transformation is a learned capability by repeated steps of forming and enacting new options, attracting or gaining access to new resource sets and allowing activity sequences to be applied in a way that continues the emergence of the new options. Organizational resilience is conferred through this iterative practice because the firm learns to embed the dynamic capability of reconfiguring resources and activities around a changing set of strategic opportunities, *"by enhancing the importance of chance, flux and unintended*

consequences” (Teece, 2007: 1343). Those opportunities that cannot attract new resources and productive attendant activities will attenuate; those that successfully attract resources and activities will consolidate and emerge into new strategic options. The disequilibrium experience thereby confers greater robustness in navigating future disruptions because of this embedded and transforming iterative skill.

2.7 HEURISTICS AND DYNAMIC RESILIENCE CAPABILITIES

Connecting Teece’s (2007) framework with Figure 1 reveals that different resilience orientations (reintegration, homeostasis and loss) can mean different development pathways for sensing, seizing, transforming abilities and therefore dynamic resilience capabilities. Actors develop firm- and situation-specific heuristics through practice by trial and error and experimentation (Bingham & Eisenhardt, 2011). Table 9 lists examples of selection heuristics based on the cognitive science work of Gigerenzer & Brighton (MacKay & Chia, 2013) (MacKay & Chia, 2013: 226). These heuristics offer a useful starting point with which to conceive firm-specific heuristics for particular situations, including for guiding resilience responses to different disorganizations. These heuristics permit resilient responses in decision contexts marked by complexity of choices, ongoing resource depletion, and closing windows of opportunity.

The skill required for actors is to learn the portfolio of heuristics, including identifying the conditions when each is best applied. A portfolio of heuristics allows actors to confront a myriad of rapidly changing circumstances,

each requiring particular nuances in heuristics. For example, the first three heuristics in Table 9 (recognition, fluency and take the best) refer to how to make choices about different decision pathways. They each emphasize selecting highly recognizable options but fluency is best when speed of option selection is most important, while 'take the best' pertains to selecting options in circumstances where more detailed analysis or comparison to selection criteria is warranted.

Table 9 also indicates the classification of the various heuristics based on Bingham & Eisenhardt (2011) into selection, procedural, temporal and priority types. Selection heuristics pertain to choosing action options, whereas procedural heuristics guide how the option is to be enacted. Temporal heuristics guide the sequencing and time-related aspects of heuristic application while priority heuristics inform the relative urgency of attention given to the options available.

The list of heuristics developed by Gigerenzer & Brighton offers a point of departure for matching specific heuristics to disorganizations across various stages of dynamic capability (sensing, seizing and transforming). Table 10 gives examples of the sorts of priority issues and heuristics which might characterize sensing, seizing and transforming for threats of each type of disorganization (strategic, operating and resource) but from a resilient reintegration perspective.

Generally speaking, selection heuristics assist sensing and seizing dynamic capability processes while procedural and temporal heuristics largely

inform seizing and transformation. Table 10 then offers a framework for matching heuristic types (selection, procedural and temporal) with dynamic capability processes and different types of disorganization. The result is a comprehensive heuristic-based resilience dynamic capability.

For each disorganization, a resilience dynamic capability requires deploying different heuristics at different times across the different processes of sensing, seizing and transforming. The 'capability' then is the ability to identify and match relevant heuristics to each process and know when to switch heuristics as processes (sensing, seizing, transforming) change over time. The results of this process will differ depending on the resilience orientation used. In turn, different resilience outcomes will also emerge from this configuration of heuristics, processes and orientations. These observations can be summarised as:

Proposition 5: *Firms that match heuristics to processes of sensing, seizing and transforming along with a resilient reintegration orientation are more likely to pursue more new opportunities rather than merely return to homeostasis or reintegrate with loss.*

If an earlier strategy architecture has failed or been abandoned and competing options prove difficult to harness in uncertain and volatile conditions, Table 10 suggests a change to the heuristic repertoire as opportunities progress through sensing, seizing and transforming. Sensing is a process where the firm perceives threats but also, from a resilience orientation, new opportunities from an emerging yet transient coalescence of factors,

including resource options, business models or partnerships. The priority issue in the sensing stage of a strategic disorganization can revolve around gaining a cohesive threat interpretation, in particular to guide which information to ignore. The heuristic of tallying removes an intuitive impulse to weight various threat options according to their eventual, albeit uncertain, negative impacts. The tallying heuristic discards any information as regards to weighting such potential negative outcomes and incorporates only the quantity of negative cues across an array of emerging threats, allowing an easy comparative interpretation despite uncertain conditions and outcomes.

Tallying as a selection activity then can be quite quickly executed, in line with the transient nature of opportunity emergence and decay. The tit for tat heuristic, outlined in Table 9, is a procedural rule for cooperative partnering with knowledge resources that allow some level of knowledge transfer to be undertaken to bridge identified gaps in the short term. Such knowledge transfer may involve providing access to typical documents such as representation or licence agreements, investment term sheets or corporate governance policies. It may involve access to established processes undertaken by the partner firm such as investor relation actions, diagnosing and enacting strategy or operational management.

Table 9: Portfolio of Heuristics to Aid Resilience (*adapted from Gigerenzer & Brighton, 2009:130)

Heuristic*	Description*	Explanation	Heuristic Type +	Example of Use in Resilience
Recognition	Infer recognised option has higher value	Disorganization forces resource conservatism. Actors need to act frugally in order to avoid resource over-use but still try to create new opportunities	Selection	Firm may seek to be financially resilient. The recognition heuristic could be used to guide selection of a law firm to advise & guide IPO process
Fluency	Infer the option recognised faster has higher value	This heuristic is similar to 'recognition' but where speed of decision-making is paramount. It means choosing options which register with actors' recognition the quickest	Selection	Resilience in the form of bouncing back from collapse can require making decisions about outside partners, accountants, law firms. Firms may be overwhelmed with options yet time may dictate speedy choice and so a fluency heuristic guides the decision maker to choose that option they recognize with most reputation. This aids additional external interactions as the reputation of the chosen actor carries weight with other potential partners thus avoiding getting bogged down in trying to make partners familiar with other partners
Take the best	Arrange cues in order of validity, select option corresponding to first cue that meets criteria	The previous heuristics are applied when information uncertainty is high. This heuristic is applied in circumstances of action option selection where your criteria for selection are more detailed and clear	Selection	Some decisions made in resilience carry greater consequences than others. Therefore it becomes necessary to make some action selection decisions that are based on more rigorous comparison to criteria. Take the best action option that meets the criteria then take the best
Tallying	Count positive cues of action options without weighting to achieve highest value	Choosing those action options that appear to have the greatest number of benefits without any further evaluation of the relative quality of those benefits. Such quality evaluations may not be possible because of time or energy	Selection	Resilience requires sensitivity to resourcing decisions. A key aim can be to make resource investments in options that will deliver the most benefits. Therefore, the firm maximizes its resource-benefit ratio

+ Heuristic type uses the same schema as Bingham & Eisenhardt, 2011

Satisficing	Select first option that exceeds aspiration level	Like 'take the best' except satisficing takes the first best option that presents and meets predetermined criteria. Search is then stopped.	Selection & Priority	Resilience can mean quick actions in order to stem resource bleeding. Where time is critical to resource salvaging and/or opportunity capture, then satisficing may be better than the fuller assessment of 'take the best'. The time that would be spent on a larger analysis is then instead used
One bounce	Continue searching for as long as options improve; at first downturn select previous option	Allowing better options to emerge and develop sequentially, postponing selection for this development, but acting quickly when signals reverse	Selection & Temporal	Allows the firm to maximize upside potential to move it faster and further to the re-generation of slack that serves as buffer for resilience
1/N equality	Allocate resources to each of N alternatives	Nurturing multiple simultaneous options with small resources in order to see which matures best	Selection & Temporal	Gives time for the better option to emerge thus enhancing resilience in terms of maximizing resource investment versus benefit
Tit for Tat	Cooperate first then imitate partner's last behaviour	Prioritise access from partner to specific information requirements that you cannot afford through other means and imitate even if partnership ceases	Priority & Procedural	Partnering may be transient, so this heuristic allows knowledge transfer from partner to the firm for key otherwise difficult-to-access actions which have longer term benefits even after engagement is broken or ceases
Imitate majority	Imitate majority behaviour of identified peer group	Form peer collective (eg. advisory board) to exchange knowledge of benefit to all members, allowing imitation of chosen behaviours	Selection, Procedural & Priority	Engaging peers and imitating their advice/example can offer experienced judgements in difficult situations thus providing a source of resilience
Imitate successful	Imitate most successful person/firm in identified peer group	Similar to imitate majority except an exemplar peer behaviour is chosen as a priority	Selection, Procedural & Priority	If environment for success is common between parties, then chosen priority action can build resilience in the firm as information accessed is gained through low learning costs
Default	When default option exists, do nothing	Follow a default option when much noise exists in environment such to make it hard to discern relevant data from irrelevant	Procedural	Avoids de-stabilization/wrong choices from acting on high noise-to-signal ratio. Avoids resource loss from unnecessary risk taking
Cultural Fit	Select option of greatest social cohesion	Selecting courses of action based on the fit between people and their ability to solve problems together rather than what they can accomplish individually	Selection & Procedural	Individual attributes that can form a collective, innovative, problem solving capability as a resource to overcome adverse challenges

Self Sufficiency	Choose partners that are willing to do most of the work not the other way round	Motivated partners that have vested interest in the task can apply their own slack resources to build the option	Temporal & Priority	Since timing of option development cannot be controlled under conditions of uncertainty, this heuristic offers virtual slack to both firms in early stages when resources are most scarce
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Table 10: Dynamic Resilience Capabilities for Disorganizations using a Resilient Reintegration Orientation

Disorganization	Characteristics	Sensing	Seizing	Transforming
Strategic	<ul style="list-style-type: none"> -Strategic vacuum -Competence destruction -Product/market failure -Generic strategy failure -Lack of coherence about future - Many strategic options possible but none stand out as obvious, given uncertainty of environment -Limited resources to pursue extensive information, with much info inaccessible without full engagement 	<p>Key Issue: Sensing new threats/opportunities relies on environmental context; can be dispersed among surviving members, leading to destructively competitive strategic agendas without cohesive rule of assessment; particularly which information to ignore</p> <p>Example Heuristic: Tallying & Tit for Tat</p> <p>Heuristic Advantages: simplifies option assessment and encourages engagement with parties that bring knowledge/process assets</p>	<p>Key Issue: Similarly, sufficiently coherent yet flexible structure is required to seize newly formed opportunities to then allow requisite operating & resource organization to form</p> <p>Example Heuristic: Tallying & one bounce</p> <p>Heuristic Advantages: Allows correspondence of tallied options to strategic goals rather than comprehensive alignment, so bypassing discordant factors outside heuristic that may dissipate over time</p>	<p>Key Issue: Iterative cycle of strategy formation from an array of options, with operating actions & resource access/attraction, underpins the transformation & rebuilding of the firm into an ordered state</p> <p>Example Heuristic: Cultural fit & Self sufficiency</p> <p>Heuristic Advantages: Practice assessing fit and sustainability of options, given resource availabilities</p>
Operating	<ul style="list-style-type: none"> -Gaps in routines of action emerge due to strategic and/or resource collapse -Routines are replaced by ad hoc decisions & actions, incoherent in relation to emerging opportunity formation - Lack of routines requires embracing complexities & tensions otherwise constrained 	<p>Key Issue: Requisite operating actions sensed in conjunction with emerging strategy option; new skills required to execute such actions are identified</p> <p>Example Heuristic: Recognition & Take the Best</p> <p>Heuristic Advantages: recognise & match actions in line with environmental requirements</p>	<p>Key Issue: Ad hoc actions implemented, in support of continued emergence of strategic opportunity</p> <p>Example Heuristic: Satisficing & default</p> <p>Heuristic Advantages: choosing first actions identified to meet objectives maintains problem solving reserves for later problems. If no clear actions, do nothing.</p>	<p>Key Issue: Ad hoc actions driven by a selected heuristic, consolidated into reliable sequences of action, forming routines utilising a stable resource base</p> <p>Example Heuristic: Satisficing & One bounce</p> <p>Heuristic Advantages: Once changes cease to benefit firm towards strategic goal, select new option</p>

Resource	<ul style="list-style-type: none"> -Dissolution of strategic assets -Working capital deprivation -Loss of credit rating -No/restricted income -Inability to sustain assets -Surviving resources don't yield coherent capability 	<p>Key Issue: Attract resources sufficient to enact emerging strategy & enable requisite operating sequences as identified</p> <p>Example Heuristic: Fluency & Imitate majority</p> <p>Heuristic Advantages: Quickly prioritise resource needs & requisite process to advantage emergent option</p>	<p>Key Issue: Access to requisite resources secured or negotiated, potentially through partner alliance</p> <p>Example Heuristic: Imitate successful & 1/N equality</p> <p>Heuristic Advantages: Imitation simplifies learning & equal spread among options of unknown future value improves outcomes</p>	<p>Key Issue: Resources translate from access to control to yield greater long term stability for the firm</p> <p>Example Heuristic: Recognition & self sufficiency</p> <p>Heuristic Advantages: Resources brought inhouse to integrate with newly acquired skills, to form new routines of reliable output</p>
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Through being exposed to and participating in procedures undertaken with an engaged partner, a focal firm can learn new skills despite at that time possessing insufficient resources to sustain the activity itself. During the course of the engagement with such a partner, the firm can learn not only the benefits of particular resources and how to extract value from them, but also how to prioritise such emergent value against other options. Taken together, these tallying and prioritising skills potentially provide a lasting benefit, even if that partnership eventually collapses. If the firm retains the knowledge for future exploitation, either alone or with other partner engagements, these sensing skills accumulate.

Following sensing, the seizing of opportunities to overcome threats requires coherence and flexibility in the organizing response. Absent sufficient resources, tallying becomes a simple selection action of assessing and comparing benefits between options, exploiting complex evolved capacities tuned to the context of cues that are present for the firm. Seizing opportunities requires a selection decision to be made and that process enacted. Accordingly, the one bounce heuristic attracts the firm to a path of improving options, discarding an option as soon as a drop in desired performance occurs. This rule not only impacts on option selection but also timing of such enactment, simplifying the judgement of complex, even conflicting, data sets in fast shifting contexts.

The transformation phase involves the application of a strategic opportunity towards realising a desired set of benefits. Enacting such

transformation remains uncertain since the chosen options themselves are likely unstable or transient. The firm aims to establish patterns of activity that are sufficiently stable to allow its capacity to expand and, should the strategic option continue to prove beneficial, to rebuild a viable future. In that case, the highest priority strategic options will be largely self sufficient, not requiring extensive or unavailable resources from the firm in the short term yet delivering readily accessible benefits. The selection and processing of such options will be guided by a rule of cultural fit between actors within the firm and those within the engaged partner. Taken together, these two heuristics of self-sufficiency and cultural fit, act to define the process of rebuilding and transforming.

Collectively, an integrated pathway of heuristic application is defined across the three processes of sensing, seizing and transforming strategic disorganizations incorporating selection, procedural, temporal and prioritising actions. The repeated practice of these adaptive activities builds a resilient strategic rebuilding capacity by avoiding set routines of action in favour of context specific and flexible rules that seek to discard irrelevant noise and focus the firm on the building blocks it can at least influence, if not control. Therefore:

Proposition 6: *Tallying, tit-for-tat, one bounce, cultural fit and self-sufficiency form a portfolio of heuristics matched to sensing, seizing and transforming that increase the likelihood of resilient reintegration and an ability to pursue new opportunities post-strategic disorganization.*

An operating disorganization is characterized by the failure of previously established routine procedures as resources, like staff, cash or alliances, dissipate. Without a resilience orientation, responses under conditions of such resource dissipation can be incoherent and without strategic purpose. Table 10 indicates that the priority issue for the sensing function of a dynamic capability for an operating disorganization is to recognise not only the activity and resource implications of a threat, but also to make resource shedding and reconfiguration decisions around possible new strategic pathways. Here the heuristic of 'take the best' is useful because it encourages a sharp focus by the firm on what actions are possible and required for each emerging option, rather than a focus on existing routines that may, or may not, meet the emergent needs. Satisficing can guide seizing because it requires an a priori articulation of the essential requirements of any potential deal, as this translates to operating action. Rarely do multiple deal options arise of equally high attractiveness so this heuristic simplifies comparative assessments; the first deal to meet or exceed essential aspirational components is accepted.

The simplified comparison sustains through to the transformation process, testing and laying down new action sequences with potentially unstable resource access and entrenching those actions that sustain long enough to yield benefits. Note the focus here rests more on reliable enactment rather than achieving reliable outcomes, as this latter condition is a function of stable routines and established capabilities. Prior to achieving such stable actions in a still resource deficient state, the firm remains sensitive to downturns in transformative opportunities so will revert to a new sensing and

seizing cycle should the one bounce occur. This enables resilient reintegration from operating disorganization by simplifying the translation of an emerging strategy into a beneficial set of operating practices, in uncertain or ambiguous conditions where the ultimate outcomes are unknowable. In summary:

***Proposition 7:** Recognition, take the best, satisficing, default and one bounce form a portfolio of heuristics matched to sensing, seizing and transforming that increase the likelihood of resilient reintegration and an ability to pursue new opportunities post-operating disorganization.*

Resource disorganizations can cripple the firm by depriving it of vital means to handle adversity if resilient capabilities are not built. Slack dissipates when resources collapse (Cheng & Kesner, 1997). Sensing of such resource disorganization requires an ability to salvage and assemble a core stock of self-sufficient resources that can be sustained due to their low dependence on other resources such as cash or external expertise. Sensing the availability or access to such resources likely requires a very dynamic identification sequence, suggesting a fluency selection heuristic coupled with an imitative process, to avoid delays caused by learning unfamiliar actions. This suggests that sensing and seizing stages occur in a close to simultaneous timeframe, reinforcing the volatile nature of gaining resources following a sequence of strategic and resource collapse. Resource priorities will be dependent on the perceived strategic goals that can be plausibly realised as different options emerge. In this context, strategy, operations and resourcing are inextricably interconnected, at least until a level of operating stability is regained and organizational

capabilities allow some measure of robust goal attainment. This suggests a pattern of equal resource distribution between options, as these exist at various times, to drive selection of resources and the timing of their use.

The heuristic of 'imitate majority' allows information gleaned from a range of competitive players to be applied to the focal firm, shortening their learning time. The process of transformation then involves shifting from mere resource access to ensuring control so that the firm has more confidence in resource reliability with which to plan future steps. While resource access or acquisition begins to satisfy the strategic goals to rebuild the firm, resource self sufficiency remains a key building block until stability replaces volatility. Incremental gains in resource control serve to reinforce the resource viability of a strategic choice made in volatile conditions, forming a resilient response to an otherwise distressed condition.

***Proposition 8:** Fluency, imitate majority, imitate successful, 1/N equality, recognition and self-sufficiency form a portfolio of heuristics matched to sensing, seizing and transforming that increase the likelihood of resilient reintegration and an ability to pursue new opportunities post-strategic disorganization.*

Complex Disorganizations

Firms may face several or all of the disorganizations listed in Table 10 at the same time, called a complex disorganization. Here the firm is challenged to identify and deploy heuristics across sensing, seizing and transforming for each disorganization. This represents a more elaborate dynamic resilience capability

based on a portfolio of heuristics (Gigerenzer & Brighton, 2009). Although more cognitively demanding, this still represents a manageable resilience response than to be overwhelmed by the disorganizations. This position is consistent with the finding that better resilience occurs when strategies are tailored to specific disorganizations (Masten, 2014). The development of such a portfolio of heuristics matched to disorganizations and processes within dynamic capabilities builds resilient reintegration, thus enabling the firm to better withstand shocks from unpredictable, chaotic environments.

2.8 DISCUSSION

Building resilience is important when disequilibrium characterizes the landscape. How can organizations build resilience? The accumulated understanding of this question in organization science is marred by inadequate conceptual groundwork which fails to make explicit all the key assumptions about the nature of resilience. The contribution here is to commence this necessary conceptual ground-work. A theoretical framework has here been offered on which organizational resilience research can proceed based on more robust conceptual foundations. Included is clarification of underlying assumptions about threats, disruptions to the functioning of the firm, capabilities for resilience building, firms' different orientation to resilience and also unpacked the concept of resilience into two dimensions: homeostasis and growth (reintegration). This contribution will help to avoid reifying resilience, yielding a construct of restricted application.

Theoretical Implications & Future Research

This multi-disciplinary excursion into resilience offers useful steering for the whole stream of inquiry in organization science. Organization science can particularly benefit from a positive adaptation orientation in developing a more robust research field. This not only will help to screen out more reification and problematic assumptions about resilience but will also retain an orientation on benefiting from adverse conditions, rather than seeking to avoid them.

Variable-focused studies can identify risk and protective factors specific to developmental stages of organizations. This can lead to indices that measure how 'at-risk' organizations are by assessing their configuration of cumulative risk factors. A similar line of inquiry could do the same for a 'resilience index' by studying protective factors. What are the risk factors that increase vulnerability and the protective factors that increase resilience at various stages of organization development? Empirical designs that look at high-risk groups but that are able to identify resilient and non-resilient sub-groups would help to identify these factors. Process studies will need to complement this focus by looking at longitudinal patterns of risk and resilience across time and developmental stages. In a prescriptive sense, an important aim of such research would be to identify the risk-based, protective-factor-based and process-based strategies that firms can adopt.

Another contribution is to a dynamic capability perspective of organizational resilience. Table 10, in particular, addresses a key question: how can heuristics guide processes of sensing, seizing and transforming before,

during and after adversity? Future research can investigate the links between types of disorganization and particular heuristics for processes of sensing, seizing and transforming. More research is needed to test which array of heuristics works best for each type of disorganization and how these achieve resilient reintegration. Research is also needed to better understand how a portfolio of heuristics works for complex disorganizations.

This conceptualization adds a dynamic capability perspective to debates about whether to abandon or fight on. The choice for severely impacted firms may boil down to a choice between persistence or abandonment. If persistence is chosen, the dynamic capability view of organizational resilience embraces learning new integration skills to overcome the extant trauma and to reduce future vulnerability. It calls for survivors of the firm to sense, seize and transform threats and opportunities so as to configure resources and opportunity constellations, including new, hitherto unimagined, incarnations or identities of the firm. This is a resilient reintegration approach to adversity which seeks to grow and transform from a negative experience.

A key aim of future research can be to develop a resilience scale for organizations. This would allow for large-scale empirical testing and comparisons between firms. Both retrospective and prospective studies are feasible. If such relationships are indeed found then the scale could be used prospectively to predict a 'resilience' index. This would articulate the state of a firm's resilience capability, leading to inferences of preparedness for future strategic, operating and resource disorganizations.

Implications for Practice – A Managerial Approach

An important implication for practicing managers is that resilience is an approach to building capabilities in good times, with coherent strategy and sufficient resources, as well as bad, with strategic and resource failures. Managers can fall into the trap of being singularly focused on getting on with their business by discovering, creating opportunities, setting goals and building a business around them. However, such adaptive execution may ignore what could go wrong for firms that lack experience with disorganization. A resilience perspective requires managers to be bi-focal. This means consciously nurturing a capacity to function during disorganization. The heuristics-based dynamic capability perspective offers useful practical guidance for resilient reintegration, even after survival-threatening traumas.

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Preface to Chapter 3

Introducing heuristics to survive firm collapse

The overall research question is: *how can firms build capabilities in resilience?*

The previous chapter served to review the capabilities literature specifically in relation to organizational resilience and leading into the use of heuristics as an effective activity selection method when resources are collapsed, unstable or uncertain and reliable routines cannot be maintained. Now the rich empirical case is presented, responding to the research question outlined in Table 2 of Chapter 1: *what capabilities are required to survive collapse?* This question relates to the overall thesis research question (*How can firms build capabilities in resilience?*) because it serves to identify the capabilities needed for resilience. The contribution is to propose a theoretical model of how heuristics-based dynamic capabilities are used for navigating through collapse. A paper based on this chapter is now targeted for submission to the Academy of Management Journal.

CHAPTER 3 | HEURISTICS TO SURVIVE FIRM COLLAPSE

Toward a Resilience-based View of the Firm

ABSTRACT

Dynamic capabilities, the reconfiguring of routine actions as applied to available resources, enable firms to manage strategic change. Such change is often understood in terms of environmental velocity assuming functioning strategy and stable resources. In this chapter strategic change is examined in the context of how firms learn and make adjustments from a position of collapse. The study documents how a firm learnt to develop a dynamic resilience capability using heuristics instead of routines, drawing on real time data across three cases of decline, collapse and re-building over a 14-year period. By embracing heuristics and adopting a resilience orientation, collapse became less a threat to the firm and more of an opportunity enabling strategic change. A resilience-based view of the firm is developed whereby dynamic capabilities with heuristics form the central component of the firm's ability to regain stability after adversity.

3.1 INTRODUCTION

The collapse of firms -- wherein collapse is defined as recognition by senior management that they lack resources to sustain ongoing operations -- has been well documented by scholars of strategy and organizations {eg. Cameron, Whetton & Kim, 1987; Lamberg & Pajunen, 2005; van Witteloostuijn, 1998). Firms are disrupted and dislocated because, inter alia, they lack key customers, relevant technologies and the ability to respond to competitive realities and in a manner that can disable standard operating procedures (Christensen & Bower, 1996; Hambrick & D'Aveni, 1988; Hambrick & D'Aventi, 1992; Tushman & Romanelli, 1994). Research on entrepreneurship and market entry, for instance, highlights not only the high base rates of failure of new ventures but documents their manifold vulnerabilities arising from their liabilities of newness (Dunne, Roberts, & Samuelson, 1988; Geroski, Mata, & Portugal, 2010; Stinchcombe, 1965). Other studies focus on the cycles that account for firms' demise (eg. Hambrick & D'Aveni, 1988; Hambrick & D'Aventi, 1992; Staw, Sanderlands, & Dutton, 1981; Tushman & Romanelli, 1994).

However, even early stage firms can rebound from collapse (e.g. Apple, JDS Uniphase and Zipcar). An emerging literature on organizational crisis, while largely anecdotal and conceptual, describes the potential for crisis to galvanize managerial attention and induce change that can reverse firms' fortunes or assure their demise (eg. Pearson & Clair, 1998; Probst & Raisch, 2005). Turnaround research describes and prescribes a two-step process wherein retrenchment of operations and assets is followed by adoption of new

routines and processes (Arogyaswamy, Barker, & Yasai-Ardekani, 1995; Robbins & Pearce, 1992). Each of these perspectives suggests that managers will go to great lengths to thwart the failure of their firms.

Left largely unresolved in these studies is how and whether firms invoke capabilities to elicit such turnaround in light of the emerging evidence that firms' dynamic capabilities are central to explaining firm adaptation when conditions are rapidly changing (Eisenhardt & Martin, 2000; Peteraf, Di Stefano, & Verona, 2013; Teece, Pisano, & Shuen, 1997). This changes the boundary conditions for applying dynamic capabilities and consequently the usefulness of a focus on sustained competitive advantage when the firm's very survival is at stake. Dynamic capabilities are "*the firm's processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match and even create market change*" (Eisenhardt & Martin, 2000: 1107). Dynamic capabilities are thus central to the management of collapse, whether routine based or not, since they requires processes to salvage, release, recombine and gain resources that enable adaptation (Brown & Eisenhardt, 1998).

Thus our research question is: *what capabilities are required to survive firm collapse?* We seek to address this question for early stage firms (i.e. those that have encountered collapse shortly after their inception) because these firms are frequently subject to dramatic and dynamic accretion and depletion of resources that materially impact performance (Baum & Oliver, 1996; George, 2005; Stinchcombe, 1965). At these firms, managers are found to marshal and deploy capabilities to thwart the failure of their firms in what has been

described as an escalation of commitment to a losing action (Danneels, 2012; Helfat & Peteraf, 2003; Ross & Staw, 1993).

To tackle this research question, and gain greater insight into how firms can reconfigure capabilities to become more resilient, we undertook an exploratory, theory-building study of an early-stage firm that underwent successive episodes of collapse. We sought to integrate the richness of practitioner insights with the rigors of a methodical research design that considered a range of hypotheses, explanations and concepts for theory building through engaged scholarship (Van de Ven, 2007; Van de Ven & Johnson, 2006). In this process, researchers collected data points from surviving decision makers to better understand, explain and predict focal phenomena (Bartunek & Rynes, 2014; Gulati, 2007; Tranfield & Starkey, 1998; Van de Ven & Johnson, 2006). Theory-building proceeded across three distinct episodes of decline, collapse and re-building with each episode representing the firm's attempt at building a capability to withstand failure or what we describe and elaborate upon as a capability for resilience.

From this research, we sought to gain insight into the capabilities that early stage firms adopt in the process of recovering from resource collapse, with managers in our focal case accepting that their firms were vulnerable but that such vulnerability could be managed. Our findings corroborate emerging evidence that in the absence of stable routines, managers reverted to heuristics that place cognitive boundaries around decision options without over-prescribing behavioural steps (Bingham & Eisenhardt, 2011; Bingham, Eisenhardt, & Furr, 2007; Eisenhardt & Martin, 2000).

In particular, our principal contribution is to delineate and elaborate upon a particular sequence of heuristics that guide firms through capability dismantling and rebuilding, a sequence that involves three core kinds of heuristics, involving strategy (choices about the firm's future), resources (choices about resources and assets required for this future) and communications (choices about whether and how to engage staff to embrace that future). These heuristics were shown to arise at four points of transition, two as the firm is collapsing and two as the firm is rebounding.

At the beginning of decline, strategic heuristics centre on identifying a core set of assets that need to be preserved to secure a platform for survival, including those that reduce overhead and strip the firm of assets that materially deplete cash ('resource heuristics'). Communication heuristics serve to warn workers of impending constraints and consequences, especially new ways to work. If, after decline, collapse ensues, then strategy, resource and communication heuristics are targeted at strategic alliances with resource-rich partners, getting tasks done through the spreading of residual human resources and collaboratively sharing strategic options with surviving staff, respectively. The ability to change and shift heuristics avoids deepening crisis and allows managers greater scope to seize new opportunities for rebuilding a new strategic future. In the turnaround phase, we discovered that strategy, resource and communication heuristics attend to assembling resources for a new opportunity, learning new activity patterns and building new systems and testing and reinforcing expected activity patterns of employees.

The chapter proceeds by reviewing insights from the literatures on a) organizational decline and turnaround, b) dynamic capabilities and adaptation and c) organizational heuristics. We then turn to the research methodology deployed.

3.2 THEORY AND EVIDENCE ON THE ROLE OF CAPABILITIES IN FIRM COLLAPSE

Literature on Organizational Decline and Turnaround Weitzel & Jonsson (1989) synthesized the literature on organizational decline by suggesting that it ensues across five *managerial* stages -- blindness, inaction, faulty action, crisis and dissolution. Some organizations decline through bad luck, but managerial error also causes and exacerbates decline because it involves, say, poor surveillance of competitors and market conditions and escalation of commitment to losing action (Bateman & Zeithaml, 1989; Cameron, Whetten, & Kim, 1987; Chowdhury & Lang, 1996; Levinthal & March, 1993; Staw et al., 1981).

Whatever the cause, the result is that the declining firm lacks cash and operates with depleted capabilities, ultimately culminating in what we have defined earlier as 'collapse'. Strategic collapse refers to an inability to implement strategy, often resulting in strategic dissension and incoherence (Lamberg & Pajunen, 2005; Sheppard & Chowdhury, 2005). Resource collapse occurs when key assets become either unavailable or inaccessible, thereby disabling operating functions and systems (Cameron et al., 1987).

Evidence on organizational turnarounds indicates that firm decline is reversible, particularly when remedies follow accurate diagnosis of causes

(Barker & Duhaime, 1997). Couched within the strategic choice paradigm (Child, 1972), this approach views managers as pro-active agents able to steer their organizations towards better adaptation, even in deeply adverse conditions. According to Chowdhury (2002), turnaround occurs when managers end the threat of firm failure with a combination of strategies, systems, skills, and capabilities. But turnaround attempts can be thwarted by resource constraints and re-alignment of stakeholders (Filatotchev & Toms, 2006). Robbins & Pearce (1992) proposed a two-stage retrenchment-recovery model, where turnaround is enabled via a first stage of retrenchment or deliberately reducing resources through staff downsizing, asset sales and so forth. Recovery is a process of renewing the firm's strategic orientation and market positioning together with revisiting opportunities and projects (Barker & Duhaime, 1997). Overall, retrenchment approaches tend to halt resource collapse while recovery redresses strategic collapse.

Largely left unresolved in this literature, however, is the question of how capabilities are transformed (or not) and the links between such transition and firm performance, a material gap in light of managerial needs to invoke capabilities to thwart collapse. Some research considers capability as operating according to a hierarchy comprising a) a base level of capabilities for acquiring resources and funding operations, b) first order capabilities that configure these resources to enable competitive advantage in product-markets and c) second order capabilities, including the ability to manage capabilities, that respond to exogenous and endogenous change (Danneels, 2012; McGuinness & Morgan, 2000; Zahra, Sapienza, & Davidsson, 2006).

Dynamic Capabilities and Strategic Change Dynamic capabilities are processes for re-configuring both resource combinations and the associated activity routines (Eisenhardt & Martin, 2000; Teece et al., 1997) with a view to creating and capturing new opportunities. But reconfiguring the firm to create and capture new opportunities in changing markets assumes the availability of sufficient resources that can assemble and deploy the capabilities. For example, in the face of a disruptive threat to its typewriter business, Smith Corona's attempts to reconfigure itself to compete in computers required sufficient resources to acquire and assemble components (Danneels, 2010).

During the decline phase, firms must first develop processes to salvage core strategic assets while releasing high maintenance resources – a process we call purposeful dismantling. Then, the firm invokes processes for the acquisition and recombination of new resources targeted at fresh opportunities – a process we call re-building. Existing case study research has shed light on how firms leverage, create, access and release resources as a dynamic capability in the face of serious environmental threats which involve organizational decline ((Danneels, 2010). By collecting data in real time, we were also able to directly witness the challenges and opportunities managers faced, providing a fresh perspective on the operation of dynamic capabilities during collapse.

To accomplish theory-building from a real time perspective involves search for the content of the dynamic capability (what is being done) but also the cognitive and behavioral constraints decision makers face in the situation. When resources have largely dissipated and the firm is in disarray, managers in our study sought cognitive guidelines in a manner that preserved some

flexibility in the range of activities pursued. Recent work in heuristics-based dynamic capabilities has highlighted such activities as core to strategic action, particularly among firms that face dynamic change (Bingham & Eisenhardt, 2011).

Heuristics and Organizational Adaptation Eisenhardt & Martin (2000: 1106) proposed that “*effective patterns of dynamic capabilities vary with market dynamism*” such that relatively stable businesses invoke routine processes (Teece et al., 1997). The cognitive and behavioral regularity of these routines means that they can be invoked somewhat automatically thus conferring efficiency gains by avoiding time-consuming analytic deliberation (Cohen & Bacdayan, 1994; Helfat & Peteraf, 2003). In contrast, in high velocity markets, Eisenhardt & Martin (2000) contend that dynamic capabilities are not “complicated, detailed, analytic processes” but rather “simple, experiential, unstable processes” that are amenable to heuristics or routine, satisfactory choices or ‘simple rules’ revolving around common judgment calls required to accomplish goals (Newell & Simon, 1972). Heuristics can be sufficiently broad as to enable behavioral flexibility alongside cognitive constraint.

When managers recognize that their firm is collapsing, they face material stakeholder pressures to foresake business as usual. Employees are concerned about losing their jobs and become more vocal about where the firm is going wrong and what action needs to be undertaken. Equity investors can attempt to seize strategic control and force certain future directions. In the face of these contrary pressures, managers are found in more stable operations to remain steadfast and resolute in sustaining existing commitments (Staw, 1975).

By contrast in dynamic environments, attendant learning can coalesce into heuristics, allowing focus on key priorities during collapse and opportunities to rebound. These cognitive guides may prove consistently reliable across episodes of collapse but at the same time permit behavioral variety in their enactment, thus helping the firm to remain dynamic in the face of flux. This presents a (perceived positive) counter-point to the (perceived negative) escalation of commitment perspective.

The heuristics perspective as applied to strategic management informs what is learnt from process experience (Bingham & Eisenhardt, 2011; Gigerenzer & Brighton, 2009). Bingham & Eisenhardt (2011) show that firms learn heuristics in a developmental order progressing from opportunity choices, how to capture them, when to capture and the ordering of their exploitation. In this view, firms develop over time a strategic portfolio of heuristics that embody the firm's dynamic capabilities.

Guided by this evidence, and cognizant of its manifestations at our research site, we have been particularly attentive to the real time managerial heuristics that were used to help manage collapse.

3.3 METHOD AND ANALYSIS

Engaged Scholarship Theory-building here reflected the limited real time attention that has been paid to the operation and fate of capabilities in the process of organizational decline, collapse and re-building (see Danneels, 2010 for an exception). Theory-building objectives revolved around engaged scholarship defined as “a collaborative form of inquiry in which academics and

practitioners leverage their different perspectives and competencies to coproduce knowledge about a complex problem or phenomenon that exists under conditions of uncertainty found in the world” (Boyer, 1990; Van de Ven, 2007; Van de Ven & Johnson, 2006: 803). In this approach, robust theory emerges through a dialectical process of synthesizing academic and practitioner perspectives and ways of knowing.

Engaged scholarship involved an attempt to generate insight through the rigor and relevance available when researchers co-build theory with practitioners as opposed to the usual arms-length detachment between researchers and the managers who they study (Coghlan & Brannick, 2010; Shani, Coghlan, & Cirella, 2012; Van de Ven, 2007). Collaborative research adopts ontologies, epistemologies and methods that are distinct from positivist science (Shani & Coghlan, 2014).

Synthesis is achieved through a strategy of arbitrage – *“a strategy for exploiting differences in the kinds of knowledge scholars and practitioners can contribute on a problem of interest”* (Van de Ven & Johnson, 2006: 803). The knowledge-in-practice of the practitioner offers real time context-specific tests of rival hypotheses while the more detached academic converts knowledge-in-practice into rigorous, more generalizable theory. Therefore, engaged scholarship is a means for synthesizing complementary and pluralistic perspectives towards the aims of rigor and real time relevance.

Van de Ven & Johnson (2006) recommend practices to leverage knowledge co-production between researchers and practitioners. First, engaged scholarship is best suited to ‘big’ research questions that are grounded in reality

and whose complexity demands multiple perspectives. We have done this by focusing on phenomena relating to the vulnerabilities of firms endemic to Schumpeterian competition – adversity, decline, collapse and ensuing opportunity – that form complex experiences that can be disentangled into data points.

Second, given the complexity of the research question, the research project should be designed as a collaborative learning community of academics and practitioners. Our research process principally involved extensive and regular interaction (at least once a month) between two academics and two reflective practitioners over 9 years, but we also from time to time engaged other academics and practitioners to freshen and sharpen inferences.

Third, the study should be designed for an extended duration to allow for more on-site observation, reflection, assimilation and yet more data gathering. Our research design involved real time data collection, field observation and theory-building that reflected the stages of collapse of the focal research site.

Fourth, these authors recommend multiple models that offer competing plausible explanations of the phenomenon. As collapse occurred we revisited relevant literatures (organizational decline, punctuated equilibrium, organizational turnaround, bricolage, improvisation, capabilities) for insights, but found theory to be insufficiently granular to inform how specific capabilities are deployed in real time during collapse. By contrast the heuristics approach to dynamic capabilities was informative and instructive of the empirical patterns we were observing (Eisenhardt & Martin, 2000; Teece et al.,

1997), providing a unifying context for previously identified conceptual ambiguities (Peteraf et al., 2013).

In particular, we studied one firm across a data period spanning 14 years where our theoretical sample yielded three episodes of a sequence of decline, collapse and re-building across this period. These three episodes offered the opportunity to trace what surviving members learnt from managing collapse in each experience and see how their capabilities for doing so developed across the three episodes.

Sample and Data Collection Our focal firm is called ActiveSky, a wireless technology company that was established in 1999. Company details follow in the next section. Rather than sample on success as a dependent variable, we selected a company that encountered a series of severe adverse shocks and faulty attempts at recovery. One of the lead investigators for this study was a senior executive at the firm allowing for first hand observation and extensive note-taking via unrestrained access to company data and its principal decision-makers.

Data was also systematically collected from other sources. Researchers had frequent and regular interviews with other surviving and departed executives throughout the nine year period. We also accessed analysis of company documents such as capital raising prospectus as well as the personal diaries of surviving members that recorded events and personal interpretations. While an array of company executives engaged in capability development efforts from inception, three key executives oversaw the rebound attempts

through the three decline-collapse-rebuilding sequences to date. Overall, 24 informants contributed information for our analyses.

At critical times, usually in a re-building phase, we held ‘arbitrage sessions’ of reflection with two main practitioners. Several objectives grounded the theory-building aims of these sessions. First, we sought to gain the various interpretations and reflections of survivors regarding what happened during decline, collapse and re-building. Practitioners had emotional, even visceral, reactions to these experiences, motivating them to want to make sense of their experience (Bingham & Haleblian, 2012) and tended to be receptive to literature that could inform their circumstances, especially regarding decline, turnaround and dynamic capabilities. Often practitioners told us that insights about routine-based dynamic capabilities did not resonate with their intuition and reflection, providing opportunities for researchers to search further for explanations. We approached such feedback as a theory-building opportunity and explored these anomalies further.

Data Analysis Our interest lay in how surviving members built a capability for managing collapse over time and to what effect. As each episode of collapse ensued the research team compiled a table with the following columns: 1) description of the threat or growth event, 2) the response to such an event, 3) the consequent interpretations of the event by firm members, 4) behavioural strategies (learning) for survival, 5) theoretical implications of the event and subsequent learning. We adopted this same table structure across the three episodes of collapse enabling comparison. Across the episodes and as learning occurred, what changed significantly were the cognitive interpretations and

behavioural strategies of practitioners. These changes occurred as a result of both academic interrogation and engagement with literature but also trial and error experimentation with new behavioural strategies sparked by new theoretical insights. Here, rigor, relevance and reflexivity were combined in a systematic process.

The cumulative result of enacting this process across three episodes of collapse was the recording of how the firm learnt to develop a dynamic capability to manage collapse. We captured the dynamic capability development process. During each episode of collapse, various literatures were studied in order to deepen understanding of causes and possible remedial actions. This process resulted in a theoretical model of how to manage collapse. However, the theoretical models became progressively richer in that subsequent models emerged from the shortcomings of previous models. So, after the first episode of collapse, articulating the five columns above served to produce a theoretical model which was subjected to wider academic interrogation as well as practical trial and error application.

As the second episode (case) of collapse ensued we again recorded what occurred. This time, managerial action was guided by the theoretical model developed from the first episode (case). Here, the managers could employ a real-time test of the theoretical model developed to help manage collapse. However, during this episode, shortcomings in the theoretical model were noted both practically and academically. Academically, the theoretical model was criticized for failing to sufficiently distinguish the prescribed actions from dynamic capabilities. This then led to a revised view of what the firm was trying

to do. We came to view the situation as one of the firm learning to build a dynamic capability for managing collapse. This then sparked an intense engagement with dynamic capabilities literature.

A third episode (case) of collapse ensued. However, during this experience the research team of academics and practitioners were conscious of developing and applying a dynamic capability-based model to better handle collapse and enable better strategic recovery. Decision-makers sought to limit resource loss but also purposefully dismantle capabilities in a way that steered the firm towards new strategic opportunities. It was at this time that the heuristics literature (Bingham & Eisenhardt, 2011; Bingham et al., 2007; Davis, Eisenhardt, & Bingham, 2009) within the dynamic capabilities conversation became apparent and matched what the firm's survivors had learnt to better managing collapse. The cumulative experience in managing collapse combined with the literature arbitrage led to the model presented in this chapter.

The timeline for our case study is shown in Figure 1, depicting the strength of organizational capability over time. Further, it signals the firm's development of a dynamic capability for managing collapse and building resilience. Theoretically, the process of arbitrage saw evaluation of many alternative concepts as ways of framing the management of collapse. These included routines, bricolage, ad hoc problem solving and improvisation (Baker & Nelson, 2005; Winter, 2003). Arbitrage between the academic and practitioner members of the research team found all somewhat, but insufficiently, helpful. Heuristics-based dynamic capabilities emerged as the perspective to yield real-time utility.

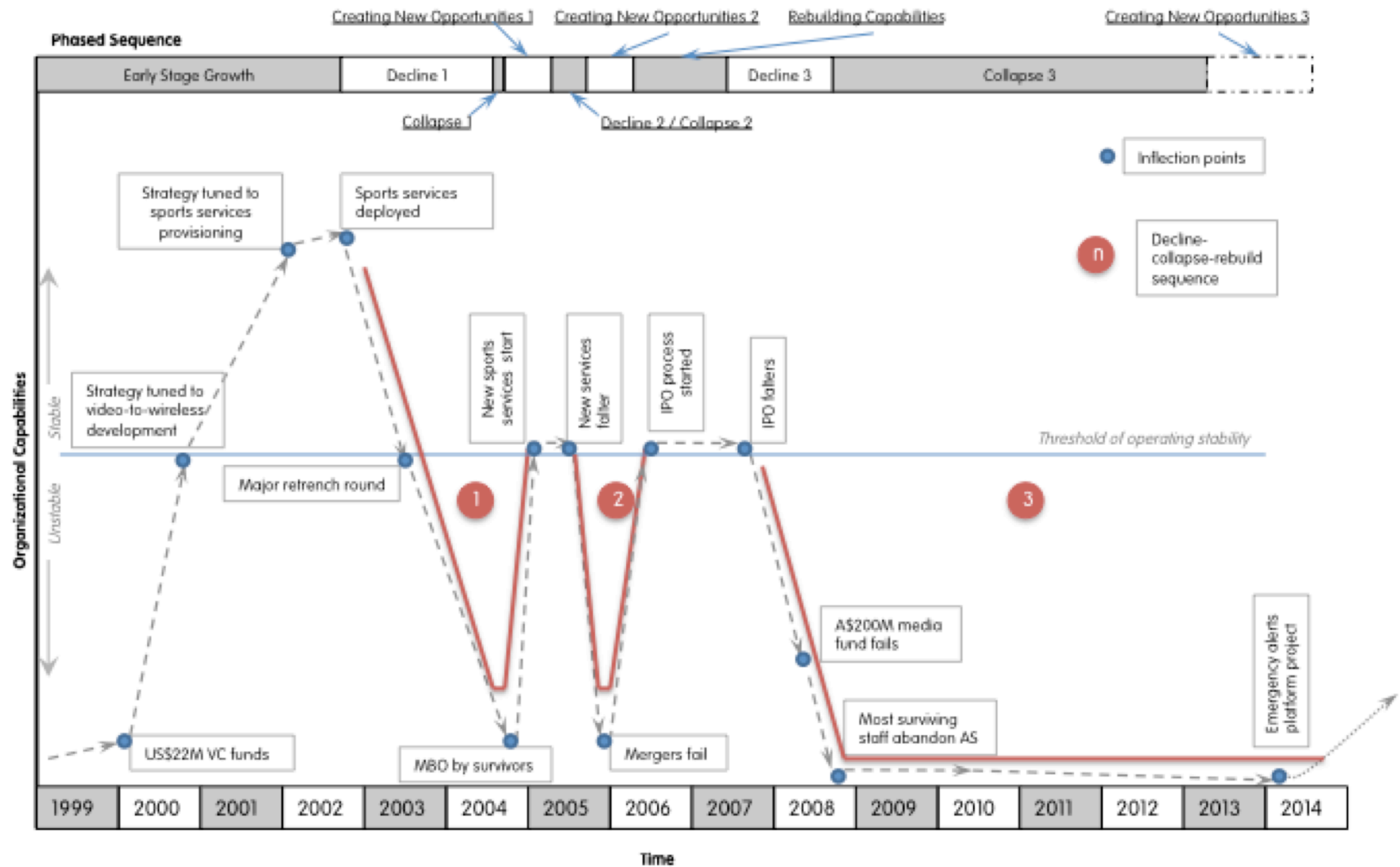


Figure 1: Timeline of ActiveSky in terms of its organizational capabilities showing key inflection points (as large dots) with descriptive boxed text with three successive cycles of decline, collapse and rebuilding from inception to the present.

Collectively, in our experience of engaged scholarship across the nine year data collection and analysis period, we found that this iterative process between theory-testing and theory-building, the subjectivity of practitioners and the objectivity of academics, yielded the richest insights and most meaning to the parties. In the next section we narrate our three cases. The aim is to show how a capability for managing collapse emerged over time from successive learning experiences resulting from collapse.

3.4 CASE EPISODES OF CAPABILITY COLLAPSE AND REBUILDING

ActiveSky is a wireless publishing and distribution technology company, founded in 1999 with offices in Australia, Japan and the US established shortly thereafter. While separate legal entities were created in each of these markets, they are referred to collectively as ActiveSky. Development work was undertaken by the technology founder to prove the concept of wireless service delivery and from these working prototypes, funding sources were courted. The company was established with angel investment funds injected specifically to attract major venture capital to build and deploy the technology, which was secured conditional on control of strategy, technology and assets being vested in the US entity.

Consequently, once these major funds were received (US\$22 million) in 2000, the US headquarters became responsible for corporate strategy, while the Australian subsidiary undertook core technology development in two offices and the Japanese subsidiary delivered local sales & development in that market.

At its peak, ActiveSky employed 76 people across the four offices spanning these three countries.

Case 1: 1999-2005

Early Stage Growth (1999 – 2003) The ActiveSky platform began to deliver an interactive, flexible and fully reconfigurable user interface on mobile devices, in an era well before the current smartphone and tablet dominance. ActiveSky sought to emulate a successful, fully resourced, substantial technology player, shaped in part by the desire to position the firm as a global provider in an aggressive and volatile market.

By mid-2000, the Board had settled on a strategy to deliver streaming video to wireless devices. This was difficult to achieve at the time, on handsets limited to less than five million instructions per second (< 5 MIPS) processing speed (compared to smartphones today routinely achieving in excess of 10,000 MIPS). The video-to-wireless strategy required all the software development resources of the growing firm as it led the field of competitors in this apparently emerging market. This market was largely unproven representing a key outstanding question: would users pay for wireless video sufficient to ensure a compelling business model?

There existed a keen urgency to build technology development capabilities to harness the acute sector interest in the platform and to establish recurrent revenues. The company achieved a stable video-to-wireless development capability when experienced project managers were employed late in 2000 and clusters of routines were built. As the platform developed, the

firm undertook trials of prototype services with telecommunications carriers, handset manufacturers and content providers in many countries, extending their alliance network.

It became apparent that the video-to-wireless strategy, while attracting significant interest from some prospective customers and erstwhile competitors, did not provide a viable revenue stream. This lack of quick strategic success led to a new strategy of real time wireless services, focusing on the sports information market.

Early commercial deals were secured with major brands in US and Japan and development resources were re-configured to accommodate the new focus. The deployment of wireless sports products in mid-2002 (US) and early 2003 (Japan), along with keen interest from the UK and German markets helped seed the firm's global presence. These deals resulted in a regular revenue stream for the firm, albeit well below ongoing operating costs.

Decline 1 (2003 – 2004) ActiveSky made a “*write once, deploy anywhere*” promise, meaning that only a single application was required that could then be deployed to any wireless device running any mobile operating system. This outcome proved expensive to realize as many mobile devices at that stage didn't perform to their published specifications, so the firm bore cost overruns arising from technical hurdles to meet this customer promise.

Consequently, ActiveSky steadily lost credibility with their alliance partners (but not with end users) as it promoted an easy deployment regime that it actually lacked. The firm could not leverage existing license deals to generate new revenues. In addition, the wireless market remained highly

volatile in terms of customers' aspirations and willingness to pay. Overall, then, the firm navigated an uncertain climate and unclear or unknowable pathways for profitable resource configuration. The uncertainty of success drove the firm to begin shedding resources to improve operating efficiency and retain cash, but strategy did not alter since the Board remained convinced about the high underlying value of the technology.

As capability gaps widened, services became less stable, subject to interruption and degradation from exogenous events. Soon, the firm was unable to mount service extensions or replacements as it could no longer reliably develop and deploy them. Consequently, revenue attrition followed, leading to a spiraling exodus of skilled staff and further setbacks to technology development. Even though expenses had dropped significantly, monthly revenues remained far below the cash burn rate, such that senior managers and the Board accepted that ongoing operations were untenable. Late in 2003 the Board packaged the platform for sale to an established player but was unable to secure a suitable sale agreement. Lacking new strategic paths, the Board lost investor support and faced the loss of all assets, including staff and the ability to glean value from the firm's intellectual property.

Collapse 1 (late 2004) Faced with the collapse of the firm, the Board accepted a last resort management buy-out wherein the surviving team assumed control of future strategy, including turnaround options and management of capabilities.

Creating New Opportunities 1 (2005) This team maintained the sports information services with declining net revenues as well as securing new sports services delivery into Asia. It was able to attract some professional services

work using their wireless technology skills, although such work brought only relatively short periods of income with limited or no upside potential. It maintained as much as it could of the surviving resource base, only relinquishing resources through unforced exodus (staff left, computers failed, licences could not be renewed). Since the strategic focus lay in recovering to former levels of operating stability, there were no attempts to jettison staff, sell assets or curb deployed applications (which were expensive to maintain).

At this time, an established mobile marketing company seeking to expand the clear platform limitations of its messaging platform sought a merger with ActiveSky in order to share strengths (their customer base, with ActiveSky's technology) to expand service delivery. Now, the survivors learnt new skills in developing the business opportunity and negotiating strategic alignments that could assure incomes at least for the mid-term.

The mobile marketing company was financed by a single sophisticated investor with deep media interests, seeking to grow revenues beyond the then popular messaging platform. By late 2005, survivors hoped that ActiveSky was on the cusp of securing growth in a completely unexpected domain.

Case 1 Capability Development: What was learnt from the experience

Critical experiences catalyzed learning and became a foundation for the building of a capability to manage collapse and revolved around: 1) switching to low resource consumption service delivery, 2) judging resources in terms of their sustainability rather than immediate operational value, and 3) assuming strategic control of decision-making within the surviving team.

The events that prompted this “*experiential learning under ambiguity*” conditions (March & Olsen, 1975: 160) along with the theoretical implications are captured in Table 1a. This Table (and the next two - 1b and 1c) capture what survivors learnt from the case experience. We identify key events which occurred across phases of decline, collapse and re-building, how the firm responded and the consequences of its attempts at remediation. The fifth column captures key learning by the survivors, while the final column then states the implications for a theoretical model.

Three classes of learning from doing under conditions of ambiguity became apparent. First, during the decline phase, when there was consistent resource loss, the firm learnt to switch from a full-cost service provision to find alternative, more resource efficient, methods of service delivery. This was necessary to stem resource loss in response to revenue decline and still be able to provide an acceptable service to end users. Examples of more resource efficient methods used included alliancing, adapting freeware source code to meet particular system requirements and replacing staff travel to meet customers with online communications to build and secure new commercial deals.

Second, in addition to switching to a low resource consumption service delivery, the firm also began to view and judge resources differently wherein surviving members ascertained desirability according to the extent to which resources could be used sustainably in the future. Resources that heavily relied on other resources for their maintenance were shed and the firm switched to a low-resource-consumption base. For example, IP applications require ongoing

payments to keep current. The firm learnt to re-evaluate the long-term value of such resources in terms of how its sustainability came at the cost of other much-needed resources. The firm reconfigured to a low-resource-consumption base, for example by shedding some of the IP portfolio, losing staff that could not sustain their commitment without regular remuneration and by adopting freeware with fewer features than commercial software options but sufficient utility to meet immediate needs.

Third, the team felt handicapped with strategic control remaining in the hands of key investors who were pursuing short-term agendas of investment returns for themselves rather than long-term business building. This made decision-making difficult in terms of choosing which resources to keep and which to shed as well as consolidating the firm's strategic recovery. The survivors learnt to value strategic control being held by those directly leading and navigating the recovery, requiring separation from those stakeholders with different agendas.

To this end, the resource constraints and process barriers being navigated were shared with remaining staff and closely-held advisors, not only to devise solutions to problems and implement agreed actions but also to build strategic coherence, as strategy adapted to emerging circumstances. Communications became a key process for binding adopted strategy to the resources that were available and, because of the small and engaged nature of the firm's members, the three classes of learning outlined above became collectively held among all the survivors.

Table 1a: Collapse Capabilities in ActiveSky | Case 1 1999-2005

Phase	Events	Response	Consequence	Learning	Implications for Theoretical Model (Figure 2)
Decline	Sought to maintain sports information service with partner provider undertaking marketing to grow subscriber base – AS had no control over marketing spend or focus	Partner disconnected from AS due to instability in service support - placed growth focus on other products & AS product declined	Survivors frustrated by lack of provider support & their own inability to reset strategy; left to deal with legacy relationships & orientation	AS survivors sought to control strategy setting, even with inefficiencies that existed as they learnt new skills	Indicates importance of heuristics around resourcing during collapse. Modelled in Figure 2 as a resource heuristic at boundary transition 1
Collapse	Survivors threaten investor controllers with non-cooperation or walk-away if strategic control not given over to them	Investors decide to hand over company to survivors in exchange for small ongoing share holding	AS survivors secure control of operating entity, ongoing strategy & patent portfolio	Judge resources on sustainability in uncertain environment rather than operational value – strategy directed by available resources	Strategic heuristics important during collapse phase. Modelled in Figure 2 as a strategy heuristic at boundary transition 2. Also, indicates a different sort of dynamic capability than used for pursuing advantage. Modelled in Figure 2 as advantage-oriented dynamic capabilities versus stability-oriented dynamic capabilities.
Re-building	AS survivors build opportunities through new partnerships with the same strategy, yet in markets previously not considered	AS able to attract resources to service new markets	New projects (in Asia) showed early growth in a chaotic market yet began to falter – not sustainable as projects nor as a competitive advantage factor	Insufficient underlying resource strength to provide operating stability in uncertain market conditions – sought alliance with a partner with resource sufficiency to maintain operating momentum. All survivors included in considering new options as these arose	Importance of operating stability and specific resource mixes for opportunity pursuit. These different than focus in capability dismantling. Modelled in Figure 2 as threshold line of operating stability and two phases of capability dismantling and capability re-building for opportunity capture

Case 2: 2006-2007

Decline 2/ Collapse 2 (Jan 2006) With the unexpected death late in 2005 of the sophisticated investor backing the project, the momentum for the acquisition evaporated virtually overnight and the merger collapsed. Within a week, the survivors had reverted to the next most attractive proposal to be acquired by a different investment consortium. Although this acquisition ultimately foundered within a few months, the project did introduce a new player into ActiveSky.

This new actor injected a radical strategic option; to prepare for an ASX initial public offering of ActiveSky stock as a technology/media play, controlled by ActiveSky survivors. This fortunate development occurred so quickly that the survivors didn't need to engage in active resource retrenchment, strategic options search or altering their patterns of activity. The IPO strategy and the networks that were introduced allowed the survivors to retain a status quo ahead of a capital infusion.

Creating New Opportunities 2 (2006 – 2007) By mid 2006, with this new opportunity horizon, ActiveSky found itself at the centre of positive financial and technological attention. For the following 12 months, they attracted a number of acquisition candidates who themselves aspired to a listing outcome but did not have the commercial networks or skills to achieve such a result. By bundling the ActiveSky platform in with these re-configured assets, ActiveSky was able to re-build a market-credible growth trajectory through acquisition to

again deliver its platform in a greatly changed market as a technology/media conglomerate rather than simply as a technology platform provider.

Rebuilding Capabilities as Resources Accrue (2007) The surviving team rallied around this new listing strategy with its clear upside potential and the firm was able to attract investment funds to support the bid. Securing the participation of four acquisition targets to be bundled into the listing added to the allure and momentum of the bid into a market increasingly attuned to new media opportunities. These funds were used to secure requisite alliance partner resources to enable the machinery of listing to proceed. Many of these partner resources were negotiated to work on an equity fee (that is, shares in the new listed entity) rather than a cash fee, representing a significant retention of cash reserves. The survivors worked to their individual strengths yet developed new skills to manage these partners, with individual survivors taking responsibility for particular tasks. Many of the required activities relied on the resources of partner firms so individuals learned to collaborate and began to predictably achieve desired outcomes. In this iterative way, ActiveSky was able to achieve a level of operating stability that hadn't been experienced since the early stage growth. Target outcomes, commonly set by alliance partners and largely utilising their resources and sequences of action, were reliably achieved as the target listing date approached.

Case 2 Capability Development: What was learnt from the experience In the Case 2 experience the firm was able to continue to make use of its prior learning from Case 1 but also gained more new learning about how to manage collapse. As in Case 1, the firm switched to a low-resource-consumption service

delivery, and judged resources in terms of their sustainability in difficult conditions. They also again experienced the essential requirement to exercise full strategic control of the firm within the surviving team, since options reconfigured so quickly in non-obvious ways that specific detailed knowledge was required to make adaptive decisions. The events, learning and theory impacts are captured in Table 1b.

A new learning was the utilisation of the routines and resources of alliance partners to assist in realising the listing goals and compensate for the lack of routines and resources extant within the focal firm. The acceptance of both the ActiveSky survivors and the alliance partners of the overall listing strategy and its benefits to those players yielded a cohesion to the way resources were applied to realise that goal. This alliance utilization came about in part because the firm had pro-actively sought to build alliance opportunities during the decline stage of Case 2, so they were attuned to the benefits such alliances could bring their otherwise restricted firm. Despite not representing a high performing portfolio of alliances, this learning nevertheless reinforces “*the crucial logic of multiple ties*” (Ozcan & Eisenhardt, 2009: 268) as a means to compensate for resource gaps by using partner routines.

Case 2 shows that by learning from their Case 1 experience, where they simply reacted to decline without managing it, the survivors were better able to anticipate future resource restrictions and to set up actions and relationships through decline that were of benefit when conditions enabled re-building. Case 2 shows improved management skill for the decline-collapse-rebuilding sequence.

Another new learning was the shift in the way survivors communicated. Instead of a motivational communication reflecting a positive mindset as existed in Case 1, in Case 2 we observed a more emotionally engaged communication style, where survivors actively supported each other through difficult and uncertain times to facilitate the harnessing of individual skills and attributes. An example was the way individual survivors may receive more funds than other survivors at a particular time, when funds were available, because of their circumstances with a home mortgage payment or the like, that was distracting them from their work. All survivors shared in these pressures on the basis that in due course, rewards would be distributed fairly. Another example is the inclusion of all survivors in identifying opportunities and setting strategy so as to gain a cohesive commitment as a proxy for stability, incorporating individual needs into the collective actions adopted.

This trusted communications environment was less evident in case 1 and indeed may have been detrimental at that time when the firm needed to shed resources and break alliances prior to its first collapse. Here, this engaged communications focus extended to alliance partners, where the resource constrained circumstances of the firm were shared with partners in seeking workable activity patterns to achieve the strategic goal. Overall, the firm learned during this case that engaged supportive communication patterns with survivors and trusted partners enhanced goal delivery and task capability.

Table 1b: Collapse Capabilities in ActiveSky | Case 2 2006-07

Phase	Events	Response	Consequence	Learning	Implications for Theoretical Model (Figure 2)
Decline	Sports information services & professional services provision in Asia declines	Sought to locate & build new alliance opportunities that exploited unique key features of software platform & could be integrated with existing revenue earning technology	Survivors oriented towards integrating AS platform into another service offering – reconfiguring development skills	New activity patterns around integration & commercial gains rather than platform development. All survivors discuss & agree to focus for each alliance option	Pro-social communication heuristic important at boundary transition 1
Collapse	Key backer of merger proposal dies, forcing new merger arrangement to be quickly consolidated	2 nd preference adopted, proves problematic; 3 rd preference option rejected	Importance of strategic cohesion between survivors; all join in process of integration	Harnessing individual skills of survivors are key to sensing & seizing new opportunities	Strategy heuristic important for navigating collapse and positioning for opportunity pursuit. Modelled in Figure 2 at Boundary transition 2
Re-building	AS coheres around IPO strategy; rely on external partners for specialist activities in what, for them, is an established, practised activity sequence	Upside of IPO means partners can be secured largely on an equity fee basis rather than cash fee (since AS is cash poor)	new option develops with coherent strategy towards IPO; new alliance network delivers stable operating focus with this strategy ; survivors experience security in again returning to stable actions albeit in new operating environment	New activity patterns in coalition with engaged specialist partners; each activity is new (to AS) & not repeated, inhibiting efficiency building; survivors work within own expertise to targets commonly set by external partners; solve problems quickly to keep partner network momentum	Strategy & communications heuristics important in capability re-building and these change at different times in the capability re-building phase. Modelled as two boundary transition points in capability re-building phase

Case 3: 2008-present

Decline 3 (2008) By late 2007, several partners began their own downturns as a precursor to the economic disruptions of the following year, limiting their ability to support the IPO. It's important to note here that the global financial crisis, despite the immediacy of the phrase, did not manifest itself overnight for ActiveSky. It unfolded over a period of some 8 months as partner services fell away and the market's appetite for a technology/media offering dissipated. ActiveSky became increasingly isolated as the year passed and by late 2008, all hope of realising the IPO had collapsed and with it the strategy that had unified the survivors.

The most significant change to note with this decline phase was the active campaign to inform all surviving staff as well as alliance partners, since all experienced the tensions of market conditions outside of their control. The mindset was that, if the IPO bid was to collapse, active engagement with partners and surviving staff would at least build a positive relationship in difficult times that may make these resources recruitable for any future opportunity building that may occur. This orientation was in stark contrast to previous phases of decline the firm experienced.

Collapse 3 (2008 – present) With the full effect of the global financial crisis in play, nearly all surviving staff abandoned the firm. ActiveSky again had no coherent strategy, nor sufficient resources to mount any renewal except the accumulated learning and its legacy reputation as a wireless technology innovator. This distressed financial position meant the patent portfolio

dissipated completely. Although dormant, the firm explored several options to insinuate the platform into a range of business licencing arrangements that each potentially could have yielded sufficient benefits to effect a re-building, yet none could be secured. ActiveSky remained legally alive as a low resource-consumption entity, retaining only a website and its corporate registration.

As learned from previous collapse phases, the survivors kept in irregular contact with former staff and alliance partners throughout this period in recognition of the shared history and interest in future prospects of engagement. This communication provided a way of testing interest in any future engagement, if the option arose.

Creating New Opportunities 3 (2013 – present) Despite the lengthy period of sustained collapse, the innovative technology reputation persisted. At the time of writing, one of the available options, first created late in 2009, appeared to have secured funding support. This project requires ActiveSky to deploy its platform as a proposed emergency alerts service. These funders remained committed to ActiveSky because of its historical reputation, deep inimitable wireless technology experience and know-how, and a comfortable cultural fit with the key decision makers built over the years since 2009. As the opportunity evolves, this single project has the potential to enable ActiveSky to rebuild operating capabilities for this and any subsequent projects that can be garnered in a completely altered wireless market, compared to the one that existed during its early stage growth.

Case 3 Capability Development: What was learnt from the experience Case

3 shows further learning within the firm while also replicating and finding useful prior learning from the previous case experiences. Here, they identify key low resource-consuming attributes as their legacy reputation, tacit knowledge of the wireless space and their relationships with potential alliance partners at some indeterminate future time. They accepted that new strategic goals and fresh resource attraction steps are intertwined and unpredictable and to rebuild the firm around some new as yet unidentified opportunity requires complete flexibility on strategic and resource dimensions. Further, because of the shared paths of the survivors and to some extent the alliance partners, they had formed a pro-social motivation to make the project work for each other, partly through emotional ambivalence as a means to cope with the doubt and hope of the venture. Indeed, *“that routinization undermines the complexity and tension needed to trigger prosocial motivation and emotional ambivalence and, in turn, mindful organizing”* (Vogus, Rothman, Sutcliffe & Weick, 2014: 595). The increasingly engaged communications between survivors and partners fed the prosocial and emotional needs of the actors.

By maintaining irregular but frequent communication with former staff and alliance partners that may offer skills and attributes that benefit a particular opportunity, the firm is able to keep abreast of resource and skill availability to exploit at a later time. In this regard, the firm can assess whether it is capable to form an opportunity at a point in time or let that option pass, based on assessments flowing from the communication cycle. The events, learning and theory impact are reflected in Table 1c.

Table 1c: Collapse Capabilities in ActiveSky | Case 3 2008-present

Phase	Events	Response	Consequence	Learning	Implications for Theoretical Model <i>(Figure 2)</i>
Decline	World economy slides into “global financial crisis”	AS unable to shield from GFC fallout – can only wait as alliances wither, such partners coping with their own fallout;	IPO target becomes impossible to achieve over 8 month period, eventually collapsing	From earlier cycles of decline, AS survivors retain low resource consuming assets ie reputation, tacit knowledge, trusted partner relationships, corporate registration & dismantle all other assets	Indicates importance of purposeful capability dismantling during collapse. Modelled in Figure 2 as dynamic capability for managing collapse and a capability dismantling phase during collapse
Collapse	IPO target collapses; all alliances dissipate	AS survivors (2) decide to wait until new opportunity can emerge where reputation, tacit knowledge & few other assets allow some traction	AS stalls as it waits for forces to form into promising opportunity	Facilitate new opportunities for survivors with a view to re-attracting them if rebuilding occurs	Importance of resourcing heuristics for strategic re-positioning and capability re-building. Modelled at boundary transition 2
Re-building	One former partner attracts funding to build out emergency alerts service & requires specialist skills	Trusted legacy with AS means survivors receive preferred partner status with new project	Once funding received, AS will re-engage with former survivors to build out new platform offering tailored to emergency alerts needs	Survivors apply features of dramatically altered strategic & technology landscape with sharpened focus on business models & resilient sustainable resources & activity patterns	Strategy heuristic for capability re-building phase

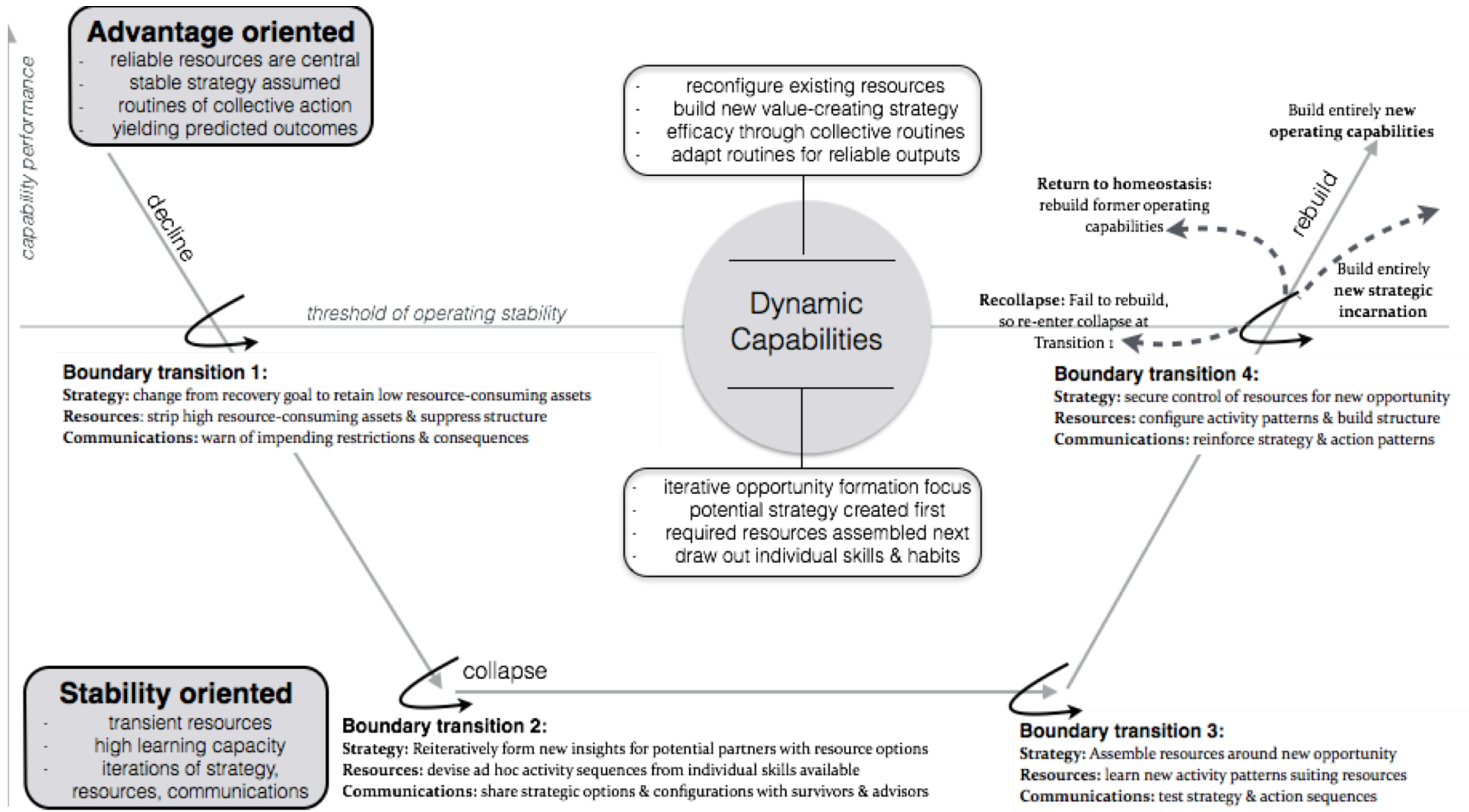


Figure 2: Process Model of Resilience Capability. Note that if rebuilding at Transition 4 fails, the model suggests reiteration back to Transition 1.

3.5 CROSS-CASE THEORY-BUILDING

These three sequences, interpreted as three distinct cases of decline, collapse and rebuilding, allow a comparison to better understand the phenomena and define how actors can survive entrenched uncertainty (Knight, 1921). We can assess the timeline looking backwards, from an uncertain future towards the certain historical path already followed, to help determine where new opportunities lie and how these can be created from fleeting circumstances (Sull, 2010; Sull & Escobari, 2004).

Figure 2 integrates the insights from across the cases to provide a composite picture of a 'resilience dynamic capability'. This term describes the ability to consistently deploy a set of heuristics and skills, in the absence of routine actions, to bounce back from circumstances of collapse. Figure 2 displays two hemispheres – positive and negative states of operating stability. Positive operating stability is a situation characterized by a level of resource sufficiency and capability for the firm to pursue its agenda for competitive advantage. Positive operating stability is represented as that territory above the threshold line. This territory is the focus of most strategy literature. Negative operating stability occurs where resource and capability loss drives a downward spiral of decline, collapse and possible cessation of the firm. This is the domain where a 'resilience dynamic capability' operates, to be discussed in this section.

Across the three episodes of collapse in ActiveSky, the ability to manage collapse and shift to an upswing towards positive operating stability is marked by two phases: purposeful capability dismantling and capability re-building.

The capability dismantling phase occurs during decline and collapse. This notion is grounded in the observation that the firm learnt to take charge of the decline and collapse process. That is, it learned not to be passive and let collapse take its own course. This learning was first observed in Case 1 but further developed as a capability in subsequent cases. Rather, the firm became proactive in the way that it purposefully dismantled existing operating capabilities in order to move to a low-resource-consumption base.

Temporal Pattern of Resilience Capability Development

Also learnt was that the firm needs to switch its priorities as decline ensues. We observed and confirmed key boundary transition points along the decline, collapse and re-build curve. The first of these boundary transitions occurs when the firm transitions from a state of operating stability to one of instability, necessitating a shift from a recovery strategy to one of preparing for collapse. It also means a shift to low resource consuming assets and the suppression of structure to yield the greatest flexibility to those who remain committed to the ability of the firm to survive the collapse. Further, communications between the survivors centre on an analysis of the restrictions and resulting consequences in terms of how the firm will seek to rebuild. In Figure 2 this is shown as 'Boundary transition 1' and 'Boundary transition 2'. The first transition occurs when instability in routine actions undercut performance and, if further decline ensues, then a second boundary transition occurs at the collapse state.

In collapse, strategy shifts from managing decline to scouring for opportunity formation and resource utilisation shifts, then to improvised activity sequences in line with possible opportunities. Survivors communicate

in the context of shaping the impact of various opportunity formations and the required resourcing to further develop such a formation. So the context of opportunity formation (Zahra, 2008) becomes a key driver for rebuilding from collapse.

The third boundary transition signals opportunity formation allowing the firm to begin to exit collapse. The focus here is a viability testing of a particular opportunity with survivors and emerging partners, requiring a transition from ad hoc activities to increasingly stable patterns of action that use newly attracted resources that in turn enable full opportunity development. The fourth boundary transition shapes the firm's return to a state of operating stability, requiring stable resources, proven activity patterns to become routine actions and a renewed focus on efficiency and performance.

3.6 HEURISTICS-BASED DYNAMIC CAPABILITY

The patterns described in the analysis of the preceding section conform to that of a heuristics-based, non-routine, dynamic capability (Bingham & Eisenhardt, 2011). They are a dynamic capability because, primarily, they are not about the development of products and/or services, as in operating capabilities, but rather the reconfiguration of resources and activities to meet changing circumstances.

Heuristics are defined as cognitive shortcuts that allow actors to quickly converge on key steps in particular situations that will likely advance the firm's prospects (Boyer, 1990; Van de Ven, 2007; Van de Ven & Johnson, 2006). Heuristics are preferred over routines in high velocity environments because of

time and information constraints in novel situations. Despite the information that is ignored, heuristics can prove surprisingly accurate relative to more detailed analyses, as well as easier to remember and apply (Bingham & Eisenhardt, 2011).

The conditions driving a heuristics-based capability had less to do with a high velocity external environment, as in traditional understandings (Bingham & Eisenhardt, 2011). In fact, ActiveSky seemed to operate in a moderately dynamic environment, possessing routine-based operating capabilities in its positive operating stability history. This finding suggests that resource and strategic collapse represents a circumstance that resists routinization and favours heuristics, regardless of external environmental velocity. This extends the identified boundary condition of dynamic capabilities in high velocity markets, where “*effective patterns of dynamic capabilities vary with market dynamism*” (Eisenhardt & Martin, 2000: 1106). Internal dynamism can also invoke capability variance.

Organizational routines embrace not only collective sequences of action, but also the rules that apply to such actions, the behaviours by which the rules are enacted and the disposition of the participants engaging in these collective actions (Bingham & Eisenhardt, 2011; Gigerenzer & Brighton, 2009; Newell & Simon, 1972). Heuristics focus more on the rules rather than specific sequences of action, giving more freedom for individual interpretation and application. This flexibility is required in unstable or uncertain environments where all the parameters that shape a particular context are not, and cannot, be known, or at least not in a timely fashion to benefit the firm.

Table 2: Identifying Capability Heuristics from Case Data

Heuristic	Relevant Event from which heuristic emerged	Example Quotes	Corresponding Boundary Transition in Figure 2
When resources fail or withdraw, maintain process with alternative or re-configured resource mix	Case 1 (2003) After retrenchment rounds, as firm became increasingly unstable, staff attrition not controlled by key decision makers forcing re-assessment of service delivery and gaps in routines of action	<i>QA (quality assurance as a distinct firm unit & separate routine) is a bit of a waste of time. If we test our code as we build it, we don't need a separate QA team AS01 Sep2003 It is important as we are negotiating with (Japan customer) that we support them and do not change the level of service that we have provided thus far. In losing (Japan AS staff), we have created a situation where they may feel as if they are not getting the support that they (have been) used to. AS13 Nov2003</i>	Transition 1: lose high resource consuming assets and negotiate service variations
Pursue multiple opportunity formation strategy to avoid single choice succeed or cease checkpoint	Case 1 (2004) Engaging simultaneously with 2 separate investment/partnering options allowed survivors to gauge strategic fit, invoking some frustration	<i>I have found it incredibly frustrating to try and complete this transaction (without full support of survivors) AS19 Sep2004 I am becoming more and more positive with regard to the potential for this business AS17 Aug2004</i>	Transition 2: generate new options iteratively allowing for those that don't grow to fall away
Dismantle imposed communication barriers to include survivors in a bid to gain greater commitment to the firm as it searched for new directions	Case 1 (2004) Firm adjusted advice & information exchange circles to garner wider contributions, breaking down earlier restrictive barriers of information flow that had been imprinted since start up	<i>Let's be sure we are on the same page before I respond we need to be realistic about what can be done on reduced burn scenarios AS10 Apr2003 We have only enough (money) to cover expenses to May AS11 Apr2003</i>	Transitions 1 & 2: include survivors in small wins and looming uncertainties, to consolidate trusted network
Leverage routines & resources of alliance partners to achieve required outcomes for strategic goal	Case 2 (2007) Fulfilling the requirements of IPO was outside the existing skillset of survivors so they had to rely on in-house skills of alliance partners to meet these needs	<i>It's like playing tennis – the aim is to keep the ball on their side of the court AS15 May2006 As these are new technologies which we ... aren't comfortable with, we need to pitch them very confidently and accurately in order to create a closed sale AS20 (partner) Oct2005</i>	Transition 3: test forming option benefits by arranging access to essential assets of partners
Deliver simplified essential requirements to meet service offerings & strategy objectives	Case 2 (2005) While considerable service gaps remained, survivors defined a very narrow service offering (bare bones) to prove the viability of the market	<i>We can add bells & whistles once we get uptake (in the Malaysian market with a sports information application) AS17 Feb2005 I think it would be great if we could get together with our respective teams to work through a few practical issues on how to take next steps. AS20 (partner) Sep2005</i>	Transitions 2 & 3: reduce service/product offering to market in line with reduced uncertain conditions

Marketing & technical functions embrace convergence & coherence of communication both inside & outside the firm	Case 2 (2005) As alliance partnership developed with mobile messaging platform firm, marketing & technical connections began to merge, unlike in earlier times when these were kept separate	<i>Starting to get urgent on this issue now. Need to provide a CLEAR statement about our recommended handset compatibility set for launch services. AS20 Oct2005 We just finished an evaluation of the ActiveSky Java App. In a nut shell we like it. AS22 (telco) Apr2005</i>	Transitions 3 & 4: experiment with new action sets towards collective actions as options grow and shift
Pro-actively retire or withdraw resources that are judged as not being able to survive collapse, utilising available resources with fragile or unstable access	Case 3 (2008) With the IPO hopes fading and alliance partners withdrawing, survivors anticipated prolonged collapse and so opted to push out processes & resources that could not be sustained, pre-empting the collapse of that routine or resource	<i>sorry I can't help more but my stuff seems to be scattered all over the place atm... so not sure where everything is. AS05 Mar2008 We do not intend for this trademark to be renewed - please allow to lapse AS02 Sep2014</i>	Transition 1: Anticipate likely resource collapses to proactively retire these when control is possible
Renewal strategy seeking to form opportunities based on relationships that value identified attributes retained from collapse	Case 3 (2010) With only legacy reputation in the wireless space, any remaining strategic insights into the functioning & drivers within that space, new opportunities are likely to be drawn from the trusted partners the survivors still maintain relationships with	<i>If (emergency alerts service partner) gets the money, we have a chance of rebuilding. If he doesn't, we'll just have to wait til something else comes along, which will be quite a long shot given where we are at present AS02 Sep2012 Great; please inject (into your proposal) that (telco) may be looking at opportunities with ActiveSky AS23 (telco) Jan2011</i>	Transitions 1 & 3: adopt a mindset to reduce corrosive collapse, dismantling resources with a view to later rebuilding them under promising conditions
Communication guided by outline rules rather than prescriptive steps so parties have freedom to adjust fit	Case 3 (2009) Instead of responding to stated needs of potential clients, firm sought exchange of needs & constraints to adjust service goals for long term engagement	<i>Their simple brief to us is think big...be future ready....and give us a solution that can be applied across all our media. AS16 Jul2008 I am quite confident about the path ahead and look forward to working with you guys real soon. I hope you are ready for iOS and Android. AS24 (emergency alerts service partner) Jun2013</i>	Transition 4: enable individual inputs of trusted network to shape activity sets and inform emerging routines

Table 2 above shows each of the heuristics that were learnt by the firm in developing a resilience dynamic capability. It shows the case from which the heuristic emerged, the key event which triggered development of the heuristic and example quotes from different stakeholders, indicating how the heuristic was shared across surviving staff. Collectively, a dynamic resilience capability requires particular heuristics and skills for different phases (capability dismantling and re-building) and boundary transitions within phases in states of negative operating stability.

From the data, most critical heuristics followed a pattern centred on issues relating to strategy, resources and communications as the three most critical areas of focus for the managing team. This pattern was upheld across all three embedded cases, across all phases of capability dismantling and re-building. The particular heuristics and skills relating to strategy, resources and communications for each boundary transition and phase are shown in Figure 2. Each of these heuristics is derived from the portfolio listed in Table 2. The last column of Table 2 shows the connection between Table 2 and Figure 2. The firm learnt that implementing these heuristics limited the damage resulting from decline and collapse and yielded a better positioning for an upturn.

Supporting the work of Bingham & Eisenhardt (2011) with regards to developmental order for heuristics, survivors showed evidence of learning selection heuristics to stabilize the firm (strategy heuristics in our scheme) first, then procedural heuristics which guide how stabilization is to be achieved (resource heuristics in our scheme) second. Furthermore, survivors' insight into boundary transitions for switching heuristics also matches Bingham &

Eisenhardt's (2011) temporal heuristics, which focus on guiding the timing of the application of heuristics. A key difference lies in phases of decline and collapse, where a stability-seeking logic supplants the growth-seeking logic prevalent through the Bingham & Eisenhardt (2011) schema. This stability-seeking logic is portrayed in Figure 2 as occurring below the threshold of operating stability, with growth-seeking logic pursued under conditions of strategic coherence and resource sufficiency.

Figure 2 illustrates some features of a resilience perspective. Following the upward trajectory through the re-building phase (boundary transition 4), four possible outcomes emerge. The firm may fail in its re-building and though bad fortune have to loop around again and repeat the boundary transitions. More optimistically, it may return to homeostasis and engage in the re-building of its former operating capabilities, where the firm has restored former circumstances. If new opportunities are perceived, entirely new operating capabilities can be built. Finally, a more radical option allows for the firm to bounce back and grow from adversity to become a different business. The perspective embraces scenarios to transform attainable futures even while strategic and resource configurations remain uncertain.

3.7 DISCUSSION

This empirical study has explored how a firm can rebound from collapse with new strategic impetus. The longitudinal case offers a rich look into the anatomy of firm collapse and, in particular, the role and texture of dynamic capabilities in the process of resilient rebounding. The work has extended both decline and

turnaround literatures by incorporating a capabilities lens to determine how firms could be capable when traditional capabilities are shattered. This has resulted in a process model of a dynamic resilience capability, with constituent phases of purposeful capability dismantling and re-building using heuristics to navigate four identified boundary transitions. The work carries a number of implications for organizational resilience, the perspective for dynamic capability portfolios and capability development.

A resilience perspective fosters a long-term focus on surviving adversity, periods when strategy doesn't work and resources dissipate. While resilience has been studied in other disciplines such as psychology (Becker, 2008), ecology (Masten, 2014) and engineering (Walker & Salt, 2012), it lacks systematic conceptual development in organization science (Hollnagel, 2009).

A resilience perspective seeks to leverage learning and experience to adjust and forge new pathways. Resilience is presented as essentially a dynamic capability for unstable systems to achieve reliable function (Weick & Sutcliffe, 2007). It embraces a pro-social orientation (Vogus et al., 2014) to surviving participants and possible partners in regaining reliable function.

Several future research questions emerge. When should a firm invest in a resilience capability and when should it exit gracefully (Peteraf et al., 2013)? For how long should a firm remain committed before exit (Dew, Goldfarb, & Sarasvathy, 2006)? Does resilience lead to different and better incarnations of the business and under what conditions (Watts & Paciga, 2011)?

A Resilience Perspective of Dynamic Capability Portfolios

If a firm adopts a focus on achieving performance based on existing or incrementally changing resources and routine actions, it will most likely view capability in a hierarchy (cf. Barreto, 2010; Dew et al., 2006). A resilience perspective places dynamic capabilities, rather than resources and routines, as central to the firm. This suggests heuristic-based dynamic capabilities are the preferred option when the firm is unstable, below the threshold depicted in Figure 2.

Under the stable conditions of strategic cohesion and resource sufficiency, dynamic capabilities are used to configure and re-configure operating capabilities. These dynamic capabilities can be either routine-based (Hine, Parker, Pregelj, & Verreynne, 2014) or ad hoc entrepreneurial action (Teece, 2012; Teece et al., 1997) depending on environmental velocity. In uncertain periods of operating instability, heuristics-based dynamic capabilities aim to restore the resource sufficiency and strategic coherence necessary to enable the re-building of new operating capabilities created from new routine and resource configurations.

Placing dynamic capabilities at the centre of a resilience-based view of the firm is a focus shift from the capability hierarchy perspective which has dominated conceptualizations of dynamic capabilities (Barreto, 2010; Hine et al., 2014). We suggest that heuristics-based capabilities are not just for firms in high velocity environments but must also be a learned skill of firms that experience collapse, regardless of environmental velocity.

The monitoring function of dynamic capabilities (Peteraf et al., 2013; Schreyögg & Kliesch-Eberl, 2007) remains to sense the requirement for strategy changes and acquiring new or reconfiguring existing resources. A key skill for firms is how they are able to build the portfolio of dynamic capabilities for different levels of operating stability and be able to switch between these dynamic capabilities, as circumstances require. We suggest that such firms stand to be more resilient, that is to better cope with survival-threatening adversities, than those that assume capabilities suited only to sustained conditions of strategic cohesion and resource sufficiency.

Capability Development

ActiveSky underwent three episodes of decline, collapse and re-building. Yet, while painful to those involved, the example has allowed an unusual insight into resilience capability. Could ActiveSky have learnt its lessons quicker, better and thus enabled faster or more advanced resilience capability development? How do rate and type of learning, experience and managerial cognitive capabilities affect capability development? Do the gains from resilience capability development as a first-mover outweigh the costs? Do first-mover firms who bear the costs of resilience capability development lose competitive advantage as the knowledge is articulated?

The heuristic patterns shown in Figure 2 at transitions 3 and 4 are a form of strategic orchestration, where a focus lies not in the resources a firm doesn't have as it seeks to rebuild from collapse, but the relationship it strikes with partners who may bring resources for mutual gain (Sull & Ruelas-Gossi, 2010).

In the absence of stable resources and reliable patterns of action, rules of thumb guide survivors to develop new patterns, new capabilities, from a position of vulnerability. From the case data collected, we propose that when routines fail, heuristics-based action allows the firm to orchestrate transient or serendipitous opportunities.

3.8 CONCLUSION

The tumultuous nature of economic markets renders the management of adversity as a fundamental issue for organizational and management theory and practice. By definition, organizational resilience engenders transformation of the firm as a direct consequence of disruptions (Lengnick-Hall, Beck, & Lengnick-Hall, 2011). In exploring the capabilities that allow firms to survive collapse, we propose a key role for iterative dynamic heuristic sequences in achieving such survival with uncertain strategy, incomplete routines and unstable resources.

Heuristics can lead to biases (Tversky & Kahneman, 1974) which, unchecked, can limit the scope of strategic and resource rebuilding for a surviving firm. Yet as an alternative to routine actions, we show they provide a promising basis for firms navigating adverse, unstable, survival-threatening conditions to interpret complex information, capture windows of opportunity, retain the freedom to improvise and co-ordinate actions (Bingham & Eisenhardt, 2011; Vuori & Vuori, 2014). Our model articulates a framework by which heuristic based action during unstable conditions of collapse can be applied.

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Preface to Chapter 4

Introducing the Engaged Scholarship Method

The previous chapter presented the empirical case to explore the capabilities required to survive collapse. The engaged scholarship method used to gather and analyze the data was outlined. The next chapter details to a far greater degree the engaged scholarship method, discussing why it was selected, how it was applied and the insights gained in its application to a real business setting. From the theory building experience at ActiveSky, the chapter asks the question: *how can academic and practitioner engagement encourage new real-time knowledge?* It frames such new knowledge in terms of the impact of the real time assistance the collaborative research project enabled for the firm as data was harvested and new theory built. The chapter is targeted to form the basis of a manuscript for submission to Journal of Business Research.

CHAPTER 4 | USING ENGAGED SCHOLARSHIP FOR IMPACT

The Rigor-Real Time Assistance Nexus

ABSTRACT

The chapter shares the learning and experience of the academic-practitioner research collaboration and how it was able to achieve the oft-perceived conflicting aims of academic rigor with practitioner impact. It aims to address the research question: *how academic and practitioner engagement encourage new, real-time knowledge creation.* This experience was gained through a nine-year collaborative research project aimed at theory-building in the area of organizational resilience. Van de Ven's (2007) engaged scholarship framework was used, but the research team needed to devise additional ways to create both academic and practitioner value. In particular, this involved providing real-time assistance to decision makers in the firm under study as well as cognitive and behavioral impact. We outline a delve-test-innovate-unlock methodology to supplement the engaged scholarship framework. In addition, we find impact measurement models in social entrepreneurship literature provide a useful guide for assessing the value of the research on the firm's practice.

4.1 INTRODUCTION

The debate on the relationship between rigor and relevance has been extensive and long-standing (Bansal, Bertels, Ewart, MacConnachie, & O'Brien, 2012; Bartunek & Rynes, 2014; Hodgkinson & Rousseau, 2009; Huff, 2000; Kieser & Leiner, 2009). Often the debate is characterized by the polarity that academics value theory and practitioners want to side-step theory and get to consulting-type step-by-step recommendations. However, action, insider, collaborative and engaged forms of research aim to bring together rigor, relevance and reflexivity (Coghlan, 2011; Shani, Coghlan & Cirella, 2012; Van de Ven, 2007). We seek to contribute to collaborative forms of research by sharing how we achieved dual aims of rigor and real-time relevance through collaborative theory-building using a delve-test-innovate-unlock methodology. We interpret the real-time impact of the collaboration using measurement tools developed for social entrepreneurship (Ebrahim & Rangan, 2014). In doing so we move beyond the rigor-relevance polemic (Kieser & Leiner, 2009) to instead focus on theory-building skills as a guide for those wishing to undertake collaborative forms of research.

In our research project, theory-building was the goal shared by both academics and practitioners on the research team. Here, practitioners learnt to become theoreticians as they exposed their routines, actions and biases to critical analysis of underlying assumptions and causal relationships. Moreover, they developed an appreciation for academic process and presentation and the need to appeal to accumulated literature. Exposure to competing theories triggered perceptions of gaps in existing theories and thus was born the mutual agenda of

academics and practitioners on the research team to contribute better theory. This was a transformative process for both academics and practitioners alike.

Situated broadly within action research ontology, epistemology and methods (Coghlan, 2011; Shani & Coghlan, 2014; Shani, Coghlan & Cirella, 2012), the project followed Van de Ven's engaged scholarship approach (2007; see also Van de Ven & Johnson, 2006). Engaged scholarship is *"a collaborative form of inquiry in which academics and practitioners leverage their different perspectives and competencies to coproduce knowledge about a complex problem or phenomenon that exists under conditions of uncertainty found in the world"* (Van de Ven & Johnson, 2006: 803). The project used the engaged scholarship approach to investigate the question of how the focal firm built capabilities in resilience. The catalyst for this research project occurred when this firm, ActiveSky, failed to deliver on its initial promise and experienced collapse on a number of occasions. Collapse manifested as both a failure of its strategy to deliver aspired benefits as well as a depletion of resources, principally skilled staff and cash. One of the key decision makers of the firm sought to understand why such a promising firm should collapse in this way and what could be done to resurrect it. A complete collapse sequence occurred in real time, during the research, and remains ongoing.

Our theory-building sought a rigorous approach while providing real-time assistance to the practitioners, as they traversed the various adversities and began to build resilience capabilities. The research goals of real-time assistance and impact required more extensive theory-building than may usually be executed in

case study research, because the findings mattered to the firm's survival. It seems that many theory-building endeavors truncate the theory-building process before the benefits of such theory to practical real-time decision-making have fully emerged across a range of operating conditions. That is, theory is not framed to guide practitioners in coping with the real problems of complex contexts, often from a belief that to do so would jeopardize generalizability (Kieser & Leiner, 2012).

Our main contribution is to introduce real time assistance as a key benefit resulting from collaborative research where both academic and practitioner goals can co-exist. Data from the focal firm of our study firm shows that the polarized debate (Kieser & Leiner, 2009; 2012) can be transcended when theory-building is a common superordinate goal of academics and practitioners. As such, our work adds further voice to those advocating action, insider and collaborative forms of research (Coghlan, 2011; Shani & Coghlan, 2014; Shani, Coghlan & Cirella, 2012). Within this tradition, our paper extends the engaged scholarship framework (Van de Ven, 2007) to include criteria of real-time assistance and impact as research goals. We contribute delve-test-innovate-unlock as a process for enhancing real-time relevance of theory-building. We also link management research with advances in impact measurement methodologies occurring in social entrepreneurship (Ebrahim & Rangan, 2014). By impact we mean a positive, beneficial change in the quantity and/or quality of a unit of analysis (eg. cognitive and behavioral changes in the practices of an individual, performance of a firm). We introduce and show how both program logic and BACKS (behavior, attitude, condition, knowledge and status) (Penna, 2011) models can help to make impact

measurement an explicit step in the research process. Both the delve-test-innovate-unlock process as well as the impact measurement tools are amenable to replication by others, thus serving to further clarify how theory-building is done, a topic often under-represented in research higher degree curriculum.

To make our contribution we first provide a brief background on the theory behind engaged scholarship as well as the debate concerning the twin aims of rigor and relevance. Then, three features of the current debate are highlighted: 1) the lack of examples of engaged scholarship in action, 2) how existing theory-building methods are prone to truncate data collection prematurely, limiting its potential to assist in real time and 3) how the combination of rigor with real time decisions leads to increased stakeholder impact from research.

4.2 THEORETICAL BACKGROUND: RIGOR, RELEVANCE & ENGAGED SCHOLARSHIP

The relationship between research and practice has been an area of intense focus, certainly for academics if not necessarily for practitioners (Nicolai & Seidl, 2010; Walsh, Tushman, Kimberly, Starbuck, & Ashford, 2007). A range of suggested actions to enhance this relationship have been outlined across a range of academic works (for a useful summary, see Bartunek & Rynes, 2014). Commonly, the methodological dilemma that emerges in articulating this sharing is framed as a tension between rigor and relevance (Vermeulen, 2005). Rigor in research is portrayed as a focus on a style of methodological purity that emphasizes technical thoroughness and refinement (Singh, Haddad, & Chow, 2007). Academic rigor is a

quest for systematic, objective inquiry into real world phenomena (Augier, March, & Sullivan, 2005).

Relevance is juxtaposed as a competing drive to yield useful applications for managers where scientific method is less critical than the complex practice of embracing differing time horizons, communications and control mechanisms (Bartunek & Rynes, 2014). Such an orientation of relevance has been used to suggest that rigor cannot be simultaneously delivered along with relevance objectives, since rigor and relevance occupy separate social systems, consigning academics and practitioners to perpetually inhabit different epistemological spaces (Kieser & Leiner, 2009; Kieser & Leiner, 2009). This view frames research conducted by academics as striving for theoretical rigor yet accepting that the research output may turn out to be less relevant to practical application than to theory development. Conversely, this view also implies that research projects seeking to inform the lived experience of practitioners is likely to be riddled with bias and weakly-held assumptions; that is, relevant but without rigor (Vermeulen, 2005).

In this narrative of polarization, practitioners are often portrayed as being antithetical to theory. This may be an overstretched injustice to practitioners precluding the possibility (and confirmed by our experience) that practitioners may indeed have a penchant for theory. Indeed, this belies the nature of action research, which is to address an organizational issue as well as to generate scientific knowledge (Shani et al., 2012). Reflective practitioners realize that theory can be a road to not only solving a present problem but also equipping them with

the skills of theoreticians, underpinning future approaches to practice. Practitioners can be theorists as well, understanding what works, what doesn't and why (Mohrman, Gibson & Mohrman, 2001).

Engaged Scholarship

Engaged scholarship encourages practitioners to join in the theory-building efforts (Van de Ven, 2007; also Van de Ven and Johnson, 2006). As a research method it recognizes and values the different types of knowledge produced in real world settings. The underlying idea is that robust theory emerges not from a single perspective alone but through a dialectical process of synthesizing different perspectives and ways of knowing.

The knowledge-in-practice context allows rival hypotheses to be tested towards useful, generalizable theory. Synthesis is achieved through a strategy of arbitrage – dialectical debate and conflict which triangulates on a phenomenon and from which a more robust synthesis can emerge (Barge & Shockley-Zalabak, 2008). Therefore, engaged scholarship openly embraces practitioners in a dialectic of knowledge co-production, recognizing that knowledge is of various types but of equal legitimacy (Van de Ven, 2007; Van de Ven & Johnson, 2006).

This collaborative exchange process includes learning, by the practitioner, to create theory by gathering and processing data as well as reporting evidence and new theories (Martin, 2010). Such learning can trigger innovation as practitioners perceive shortcomings in existing theories and discern new extensions to explain complex phenomena. Engaged scholarship provides an environment for such skills learning to ripen.

4.3 BUILDING ENGAGED SCHOLARSHIP SKILLS: EXTENDING THE TRADITION

Engaged scholarship represents an opportunity for academics and practitioners to harness each other's strengths to co-produce knowledge. However, based on our experience in working with the method, there are three areas of the engaged scholarship tradition where further value can be unlocked: 1) The need for empirical examples and a research community, 2) how to incorporate real-time assistance and 3) delivering impact through research designs. We believe progress in these areas will help to increase the presence and contribution from engaged scholarship methodologies within business schools and published research.

The Need for Examples and a Research Community

The potential benefits of an increased use of engaged scholarship research methodologies include greater collaboration between academe and external stakeholders, greater flow of research outputs to actual impact in the world, and more robust, useful and insightful theories due to the triangulated perspectives of different stakeholders (Martin, 2010).

For such benefits to be realized requires the building of a vibrant research community, necessary to build upon Van de Ven's (2007) framework and provide ongoing refinement to methodologies. An engaged scholarship research community can share insights and experiences thus helping to build legitimacy, researcher skills, and provide a broader array of research path options to would-be researchers (Mohrman et al., 2001). In terms of the rigor-relevance debate, such a

community is necessary in order to build the critical mass of empirical examples to support arguments made in defense of engaged scholarship (Vermeulen, 2005).

Theory and Real Time Assistance

Theory-building from traditional case study research does not explicitly make real-time assistance to practitioners a criterion of the theory output (cf. Yin, 2009). That is, theory-building stops when an adequate, valid and reliable explanation of a phenomenon is achieved. Such theory could be regarded as staying at a safe distance from the action, by observing, inquiring and probing the factors at play but not fully engaging to solve real world problems. Yielding real-time assistance requires connection with the decision contexts of the practitioner.

For instance, our organizational resilience research explores how firms interpret and survive severe adverse conditions that may threaten the firms' survival. Theory-building here needs to explain the anatomy of threats and firm responses in order to understand the constraints under which decisions need to be made. In turn, such explicit appreciation of this decision context further deepens theory-building around the anatomy of collapse and firm responses. Our research led to the heuristics literature (Bingham & Eisenhardt, 2011; Bingham & Halebian, 2012; Mousavi & Gigerenzer, 2014) as a way to explain empirical phenomena and guide decision-making in real time. This synergy between theory development (how we were conceiving of firm collapse and organizational resilience), operating decision context (highly ambiguous and resource-constrained) and actual practitioner decisions involved four major cyclical phases with a total of 15 steps, a process we detail later (in Section 4.5).

Delivering Impact

All researchers seek to deliver impact on the real world (Pettigrew, 2011). The measurement of impact is a topic that is receiving high levels of attention in fields such as in the non-profit sector, social enterprises as well as management academe more generally (Ebrahim & Rangan, 2014). We define impact as a beneficial change in the quantity and/or quality of a unit of analysis, being either individual actors within the firm, the firm itself or specific capabilities deployed to achieve the objectives of the firm.

In our research we interpreted impact in terms of cognitive and behavioral changes to the practice of the firm's key decision makers in handling severe organizational disruptions which threatened survival. This is a measure of how our theory-building research led to learning outcomes for the practitioners which changed their cognition and behaviors. These changes impacted on the organization's performance through their ability to avoid disintegration and to bounce back from collapse, showing evidence of new resource accumulation, capability development and re-strategizing.

The measurement of impact, from our research, assesses the links between theory development and the real-time assistance provided by theory-building. It is not a retrospective post hoc examination of relationships between independent and dependent variables.

In the next section we share more detail regarding alignment between the research goals of rigor and real-time assistance and the impact these qualities had on the focal firm.

4.4 A BRIEF CASE OUTLINE

ActiveSky is a wireless technology company that was founded in 1999 with venture capital funds, headquartered in Silicon Valley with additional offices in Australia and Japan. The firm grew rapidly in the period up to 2002 and seemed on the cusp of benefiting from the explosion of demand for wireless services at a time when the potential of this medium was only beginning to be tapped. Yet the early traction was not sustained and the company began to decline, reducing staff and overall technology development capabilities from 2003 onwards, even collapsing briefly in late 2004. Yet two actors within the firm secured control of the firm as well as new funding and began to rebuild capabilities towards new strategic goals. Despite some promise, this new strategy also did not sustain the firm and it experienced a second collapse in 2006.

It was this second collapse that caused one of the actors to initiate a research project, seeking to understand why the firm was experiencing such difficulties despite the general positive outlook for wireless technology and how capabilities could be rebuilt from a collapsed state. A new strategy was distilled, new support and resources attracted and, in spite of good early traction, the firm experienced a third collapse during 2008, the year of the “global financial crisis”.

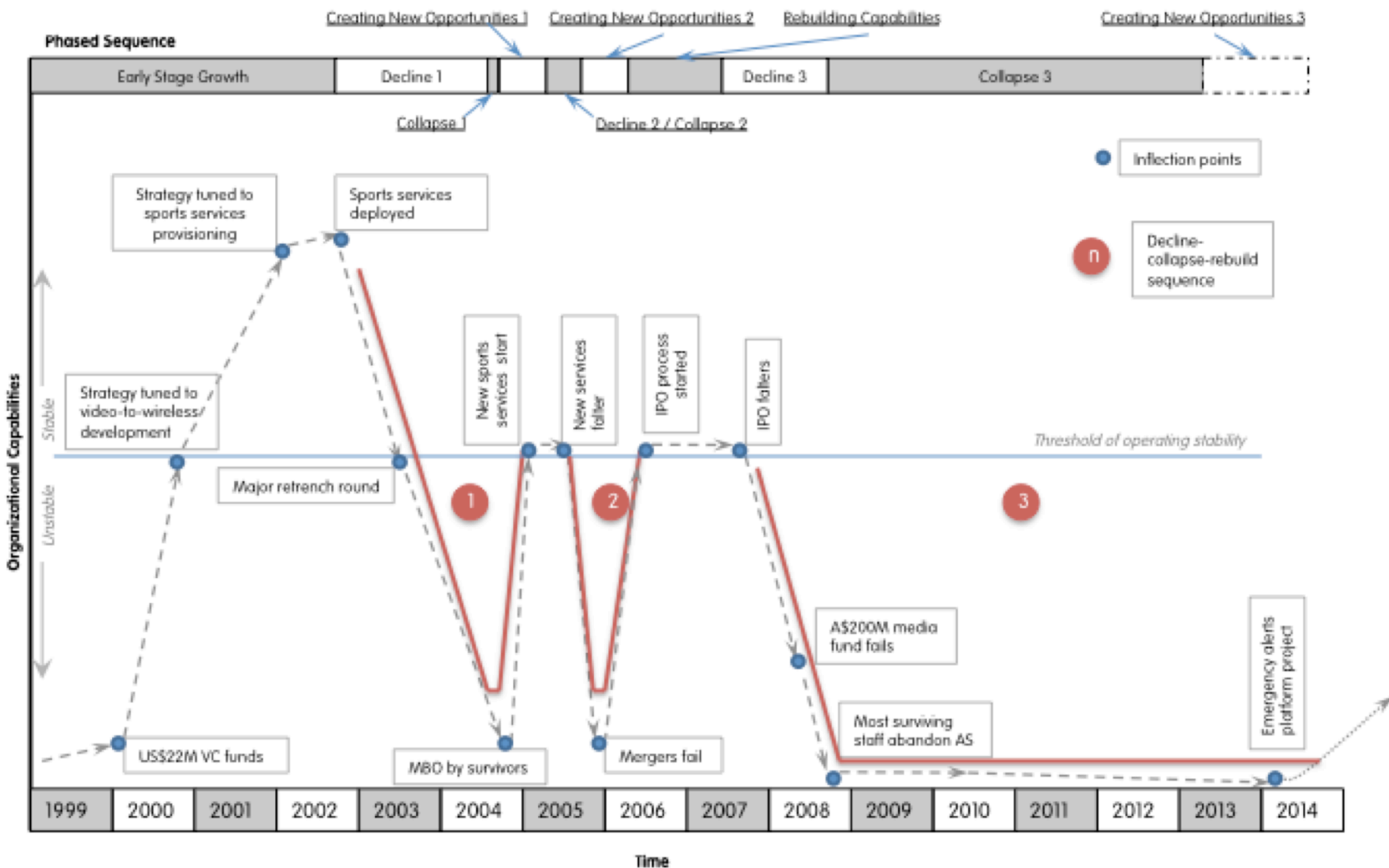


Figure 1: Timeline of ActiveSky showing three iterations of capability decline, collapse and rebuilding with key capability inflection points (as large dots) and descriptive boxed text from inception to the present.

This progression of three sequences of decline, capability collapse and attempts to rebuild new capabilities is shown by the timeline in Figure 1. Initially, after applying venture capital funds to attracting specialist resources and building capabilities in areas such as software and business development, project management and adopting a sports services provisioning strategy, the firm yielded reliable, routine outputs with stable operating performance. When they were unable to leverage these early successes into continued revenue growth, resources were retrenched and capability decline became embedded leading to the first collapse. The reputation and reach of the firm's capabilities allowed a new diversified strategy to be enacted, attracting sufficient funding and revenues to facilitate some rebuilding.

However, before this growth could stabilize a key investor withdrew and a brief second collapse ensued. Subsequently, a new strategy centered around an initial public offering (IPO) as a technology driven media company drew considerable market attention and buoyant valuations, based on the proven wireless platform development capabilities demonstrated in earlier years. The onset of the "global financial crisis" early in 2008 caused this IPO strategy to unravel leading to the third and current collapse. Taken together, this series of capability decline, collapse and rebuilding led to the theoretical and practical insights of heuristics to guide capability renewal under fast changing conditions¹.

¹ Further detail of the case is given in Manfield & Newey, 2015 where the capabilities required to navigate decline-collapse-rebuilding sequences are explored.

Engaged Scholarship Team Procedures

Throughout the project we had assembled a core theory-building team consisting of three academics and two practitioners who all remained with the research project across the nine years. This core team was supported by a peripheral team of transient practitioners fulfilling key roles. So we studied 14 years of the firm's history in total with the research team itself operated for nine years. This constitutes nine years of real time data and five years of retrospective data.

Data collection included aspects common to traditional case study methods, including 126 interviews with diverse stakeholders and recording of daily diaries. But, true to engaged scholarship, key data also included real-time descriptions from practitioners in the core research team of what was being experienced, the sense they were making of it, strategic and tactical intentions for dealing with the circumstances, as well as options. The academics on the team were on hand as these events were occurring to ask probing questions, examine the cognitive frames of practitioners, identify relevant literatures and assess opportunities for theory-building and skill coaching.

The academics on the team were sensitive to those circumstances where existing theory failed to adequately explain the focal phenomena and proved unhelpful in guiding practitioners in real time. Practitioners would undertake detailed reading of key literatures such as turnaround, the resource-based view and capability research as well as resilience literature from multiple disciplines (psychology, engineering, ecology, organization science). When practitioners experienced disquiet with established literatures and their inability to explain or

help, the academic team sensed this as opportunities for building new theory. Focus groups meetings between academics and practitioners on the core team occurred frequently over the nine years of the study. These meetings would examine the links between the empirical phenomena, established theory shortcomings and the discussion of alternative explanations.

4.5 THE RIGOR-REAL TIME ASSISTANCE NEXUS

Adding Real-Time Assistance to Data Analysis & Theory-Building

Figures 2a to c represent the progressive theory-building outputs along our nine year journey of tracking and working with our focal firm. The figures represent the outputs from our own iterative skill-building. Figure 1c is the ultimate product of our research to date. Key to arriving at this result was a cyclical process of Delve-Test-Innovate-Unlock and 15 underlying steps, which kept the team pursuing the theory-building process and prevented premature truncation.

Table 1 illustrates the four phase, 15 step process we enacted, and the progressive theoretical models as depicted in Figure 2a, 2b, and 2c that emerged from this process.

Phase 1: Delve (7 steps)

Table 1 shows that our first step was to deeply engage with the empirical phenomenon of interest: organizational collapse. This exercise in construct validity involved defining key terms (such as firm collapse), identifying sub-parts (such as strategic and resource collapse), defining sub-parts and identifying their constituent dimensions, comparing our definition and description with existing

literature, noting any new phenomena, testing how collapse temporally unfolded and noting its effects. We then examined firm response strategies including what was done (behavior), the beliefs which underpinned these strategies (cognition), what worked, what didn't, what was learnt from the experience and what was retained for future use. This is a highly descriptive step with a postponement of analysis so to establish the boundaries and nature of the phenomenon under investigation.

Delving into an empirical phenomenon is a standard requirement for engaged scholarship and process research traditions (Pettigrew, 1997; Van de Ven, 2007). However, as one of our aims was to offer real time assistance we undertook a number of key steps to assist with this. We sought to better understand the decision context of the practitioner, including understanding their constraints in terms of resources, their cognitive frames in terms of how they were interpreting the experience of collapse as it unfolded, the sequence of events that led to the current position and identifying controllable and uncontrollable factors.

In testing for real time assistance we also asked the practitioners on the team how the emerging model (Figure 2a) would guide them in real time and how it offered anything new and better to what they already knew. We were able to detail the construct of interest (firm collapse) and its dimensions (strategic and resource). We were able to also specify what we saw as the ultimate aim (firm recovery) and its underlying dimensions that response strategies needed to target (strategic and operating activities).

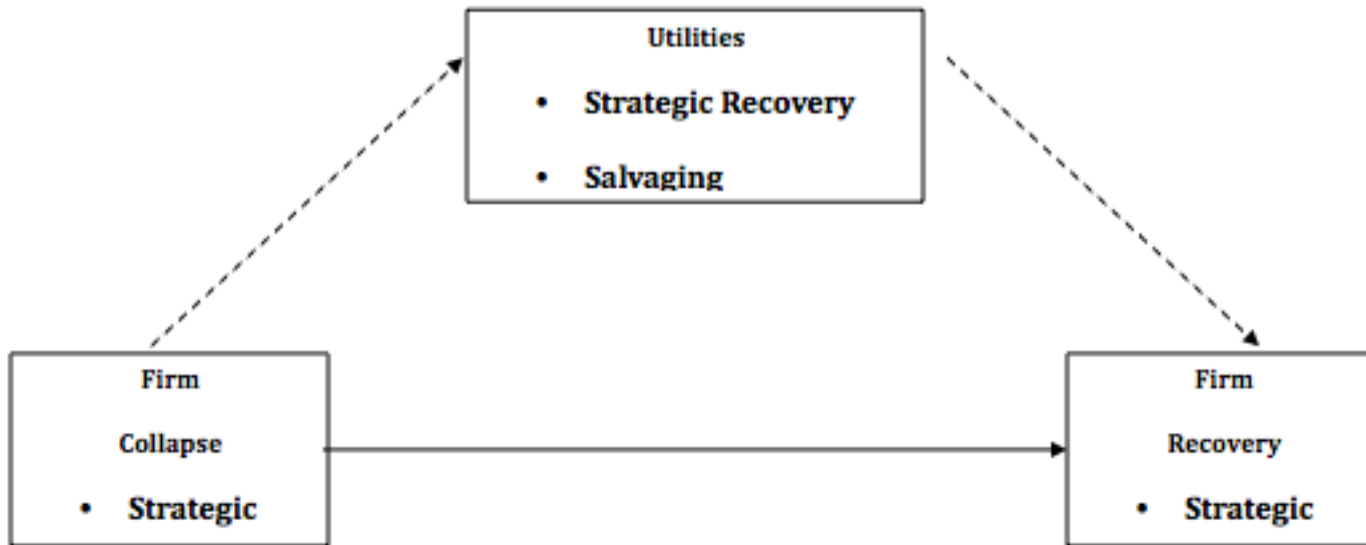


Figure 2a: Initial Cause-Effect Model based on Utilities as a particular dynamic capability

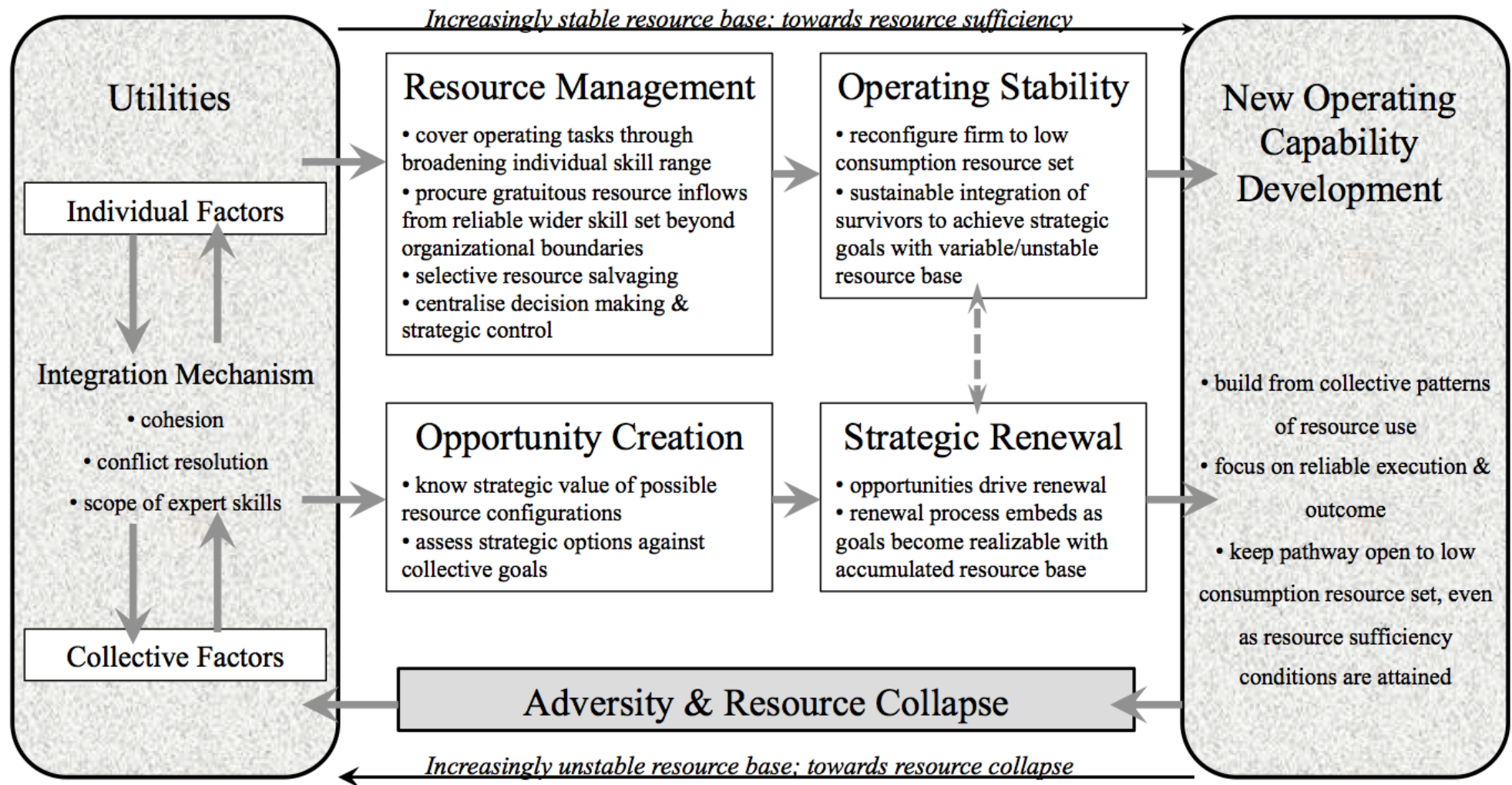


Figure 2b: Microfoundations of Utilities and their relationship with New Operating Capability Development as the firm changes from unstable states (requiring utilities) to stable states (allowing reliable routine actions).

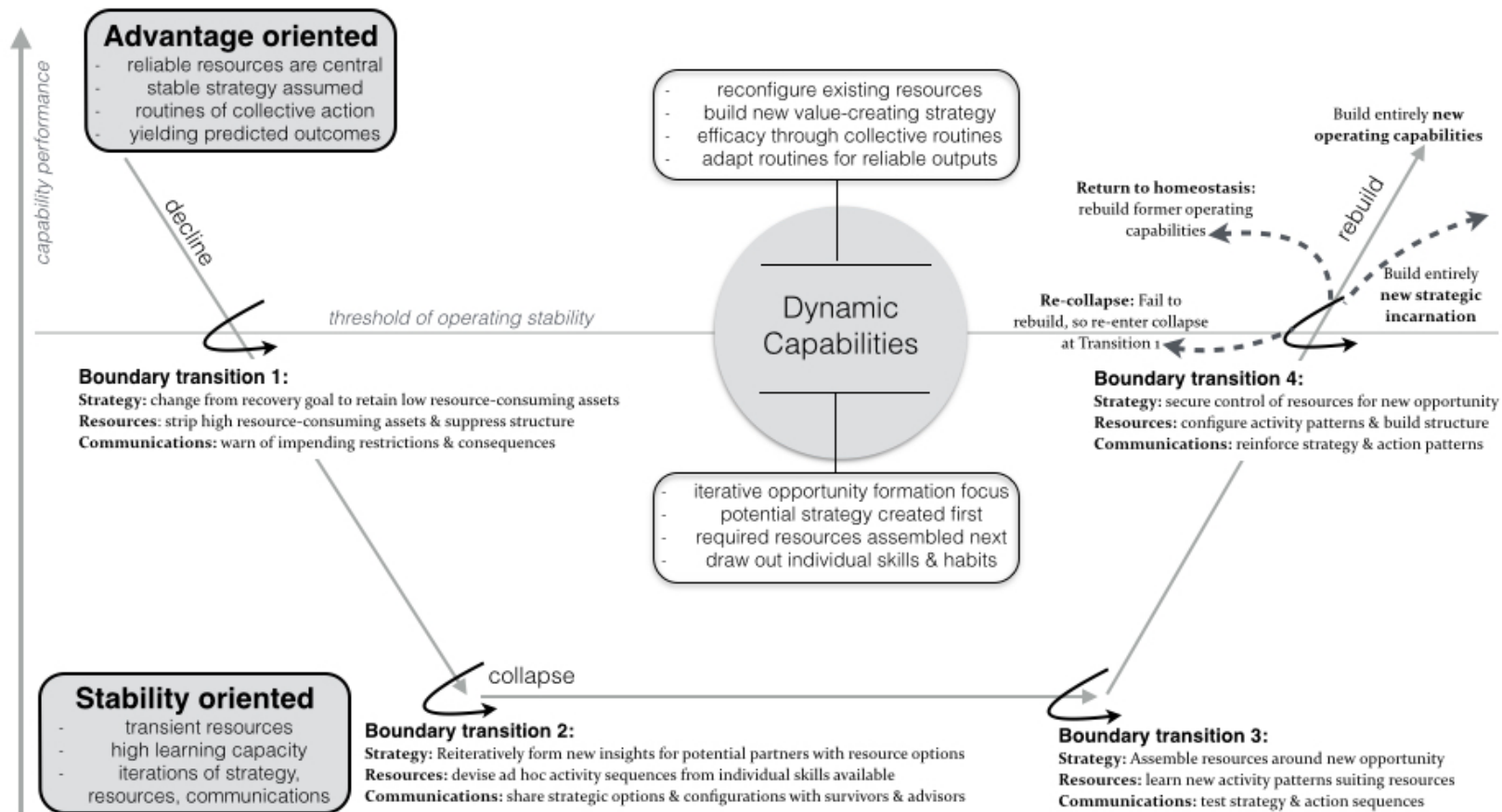


Figure 2c: Resilience Capability depicted as enacting four distinct sets of heuristics as the firm strives to regain stability with attendant strategic cohesion and resource sufficiency.

Table 1: Delve-Test-Innovate-Unlock Process

Delve-test-innovate-unlock process phase	What We Did	Resulting Figures
Phase 1: Delve into the anatomy of organizational collapse	7 steps: <ol style="list-style-type: none"> 1. Forensic exercise in construct validity defining key terms 2. Defining sub-parts and identifying their constituent dimensions 3. Comparing our definitions with literature 4. Noting any new phenomena vis-à-vis literature 5. Testing how the collapse unfolded and its effects 6. Examining firm response strategies 7. Examining what was learnt from the experience and retained for future use 	Activities resulted in drafting initial cause-effect model based on utilities as a particular dynamic capability This model is illustrated in Figure 2a.
Phase 2: Test emerging model for rigor, real time relevance, impact	2 steps: <ol style="list-style-type: none"> 1. Submission of manuscript based on utilities model (Figure 1a) 2. Seeking wider practitioner feedback in regard to model 	Tested the initial theoretical model (Figure 2a). Feedback from this test phase led back to another delve phase where more data was collected.
Phase 3: If model fails tests, then Innovate	2 steps: <ol style="list-style-type: none"> 1. Failure to pass tests of rigor and real-time assistance with model 1a: Engagement in theory-building innovation 2. Second ‘delve’ phase and test phase 3. Abandoned failed theoretical frames (utilities) 4. Adopted new perspectives: dynamic capabilities and resilience 	First round of innovation resulted in new theoretical model (illustrated in Figure 2b). In this much more advanced model, we remained committed to ‘utilities’ concept but delved substantially deeper into anatomy of utilities. Second round of innovation produced Figure 2c, which resulted from abandoning utilities and adopting heuristics-based dynamic capability frame
Phase 4: Unlock value from new perspective	2 steps: Unlock full potential of new perspective to fulfil both academic rigor and real-time assistance. <ol style="list-style-type: none"> 1. Successive rounds of external academic feedback 2. Following focal firm’s decision makers through 3 collapses. 	Activities resulted in theoretical model as illustrated in Figure 2c. New model emerged by using the heuristics perspective after having studied three episodes of collapse and rebuilding.

Our analysis of what worked in achieving recovery led us to conceptualize a new family of activities. This new family of activities we called utilities and believed we had something new to say about a key problem in capability literature (Winter, 2003) concerning how capabilities are formed. The literature contained arguments that capability development begins with ad hoc problem solving which, when codified and replicated, evolves into a capability. Capabilities are defined by their routinization, exemplifying that the firm has become capable in identifying a set of activities and processes that enable it to get a job done. However, when we examined our data we felt that how firms need to deal with collapse is not through either ad hoc problem solving or capabilities. There was an intermediate class of activities, which were labeled utilities. This became the focus of our theory-building for the next few years.

Phase 2: Test (2 steps)

Table 1 highlights that, after developing an initial model (Figure 2a), we needed to test it with peers, both academic and practitioner. We submitted Figure 2a and its accompanying manuscript for review at a high tier journal. This was a test of academic rigor and our claim of having new theory (the utilities construct). The paper was rejected as reviewers found our arguments unconvincing in comparison to existing capabilities literature (Eisenhardt & Martin, 2000; Teece, Pisano & Shuen, 1997). These reviewers also sought greater specification of the dimensions and nature of utilities.

We also sought wider practitioner feedback to test for generalizability in how well we satisfied the real time assistance criterion. The paper was sent to

three experienced practitioners and this was combined with a focus group for the airing of critiques of the model and new learning. Feedback from this Test phase led us back to another Delve phase where we needed to collect and analyze more data that could help us to better conceptualize utilities and offer more fine-grained real time assistance. Three main conceptual challenges lay before us: 1) demonstrating that utilities was a distinct and novel construct, 2) better specification of utilities and 3) more fine-grained real time assistance for practitioners at different stages of the collapse process.

Phase 3: Innovate (4 steps)

When we failed to pass tests of rigor and real-time assistance with Figure 2a, yet remained committed to the utilities idea, we undertook an incremental theory-building innovation (Table 1). Unexpectedly, the firm began to experience a second episode of collapse. This enabled a second 'Delve' phase and gathering comparative data between the two episodes. Moreover, strategies developed in the initial Delve phase and embodied in Figure 2a were put to the test to see how well they worked, in real time

This yielded Figure 2b, with several noteworthy aspects. Experiencing the second episode of collapse and recovery allowed us to observe at close range the anatomy of utilities, to specify their nature at the level of individual cognitions, emotions and skills as well as collective factors of coordination.

We subjected the resulting new model (Figure 2b) and its accompanying paper to a Test phase through journal submission and practitioner review. Again, the utilities idea did not gain acceptance from academic journal reviewers as a

construct distinct from capabilities. However, the construct as represented in Figure 2b did start to impact positively on the focus group of practitioners who reported some level of assistance yielded by the model.

Consequently, three turning points occurred: 1) jettisoning the utilities concept and embracing dynamic capabilities as a frame, 2) deeper engagement with the decision context of the practitioner yielding insights into heuristics and their role in decision making under conditions of uncertainty and 3) re-framing collapse as a process of resilience.

Jettisoning Utilities For a number of years now we had been viewing the problem through the lens of utilities and had dismissed the value in the perspective offered by dynamic capabilities (Eisenhardt & Martin, 2000; Teece et al., 1997). The feedback from rigorous academic and practitioner review revealed a new aspect of dynamic capabilities, without needing a new construct of utilities.

Deeper Engagement with Practitioner Decision Context Our excursion into dynamic capabilities literature led to a sub-field which explores how decisions can be made in highly dynamic and fluid environments, where routine actions cannot be maintained (Teece, 2012). These ‘simple rules of thumb’ can guide action within certain parameters without over-specifying how the rules should be carried out (Bingham & Eisenhardt, 2011). Heuristics provide some decision structure but preserve a degree of behavioral flexibility given the dynamic nature of a particular context. This exactly matched what we were finding with our data and how the firm’s key decision makers had learnt to deal with collapse. This insight provided a new lens to assess the role of resilience.

Construct Re-framing The term ‘Innovate’ does not mean that all theory-building pursues radical new perspectives and ways of understanding a phenomenon. It means considering alternative ways of sensemaking (Sandberg & Tsoukas, 2014) that may unlock greater explanatory and predictive theory to aid real-time decision-making. This alternative sensemaking brought a resilience focus and marked a shift in the core research question. Instead of exploring how capabilities emerge in adversely impacted firm to rebuild growth performance, the team now sought to explore the capabilities required for the survival of an adversely impacted firm. The team had access to deep data across three cases of collapse.

The shift to resilience was a turning point in unlocking new value from our research because resilience was commonly represented as a recovery from adversity to a former homeostasis. The embedded case analysis instead indicated a resilience focus as yielding new future pathways, not simply recovering a former pathway to growth, representing a transformation of the firm. This innovation was driven by the need to provide real-time assistance to the firm as it lived through adverse conditions. Neither turnaround literature nor the practitioners themselves were viewing the problem from a resilience perspective.

Phase 4: Unlock (2 steps)

Figure 2c represents the outputs of this phase in our theory-building which yields our best alignment with successive rounds of external academic feedback and practical requirements for providing real-time assistance to survivors in the focal firm. After three episodes of collapse, the firm has developed a capability in

resilience that aligns the decision context (dynamic, highly fluid), constraints (few resources) and opportunities (desire to persist) with a decision-making form (heuristics).

Seeking Impact

Traditionally, impact is measured in terms of academic citation rates in the hope that findings will filter into lecture rooms and executive training programs in order to disseminate better practices (Aguinis, Shapiro, Antonacopoulou & Cummings, 2014). We propose extending this measurement to include impact on practice. Improved firm performance is generally regarded as a contribution of research. Engaged scholarship explicitly seeks to solve problems through research design and theory building rather than directly improve firm performance (Van de Ven, 2007).

In order to understand how impact and its measurement could be built into our research process we turned to the literature on impact measurement adopted in the field of social entrepreneurship (eg. Ebrahim & Rangan, 2014). Since research of the focal case incorporated elements in common with this field, we chose include the traditional program logic model (Ebrahim & Rangan, 2014) and the BACKS model (Knight, 2002; Penna, 2011) as impact assessment tools. The program logic model requires actors to specify their chain of inputs, activities, outputs, outcomes and impact from their service provision. This allowed us to trace changes in both theoretical and practical inputs, activities and outputs and

how these led to changes in outcomes and impacts². As our practitioners experienced each round of firm collapse we determined what they were learning (inputs) and how this led to different responses (activities), outputs, outcomes and impacts.

We sought to capture direct beneficial impact on the entrepreneurs themselves as well as the venture by measuring outcomes (direct impact) using the BACKS model (Knight, 2002; Penna, 2011). BACKS is an acronym for Behavior, Attitude, Condition, Knowledge and Status. These five parameters frame an assessment of impact on the entrepreneurs and the venture. In terms of behavior we wanted to know how new learning from theory and practice resulted in different and hopefully better practices in managing collapse. We also sought changes in attitude towards collapse, including how it was viewed such as whether it meant the end or the beginning of something new. In the BACKS model, condition refers to the state of a subject (person, entity, thing) against an accepted, or social or cultural or universal standard (Penna, 2011). Five stages along a continuum of stability are widely used in the social sector and we were fortunate that this model is also directly relevant to our context of collapse. These conditions range from “In Crisis” through vulnerable (about to fall back into crisis), stable (no imminent danger), safe (remedial action appears to be holding) and onto thrive (positive adaptation to adversity).

² In this literature, a distinction is drawn between outcomes and impact (Ebrahim & Rangan, 2014; Penna, 2011). We actually view outcomes as a form of direct impact. In our Table 2 then we distinguish direct impact (outcomes) on a focal client from wider impact on wider stakeholders.

Table 2: Using a logic model for interpreting the impact on theory and practice of engaged scholarship

Chronology - Inflection Points in Learning	Inputs (Practical: Assets & Resources available; Theoretical: knowledge to deal with situation) →	Activities (how responded to collapse) →	Outputs (Strategy & Operations) →	Outcomes (Direct Impact) (new learnings, behaviour etc from activity-output experience)→	Wider Impact (Practical & Academic)
2003 to 2008	<p>Practical: Loss of almost all resources except two founders, intellectual property, some brand reputation, motivation to continue venture and recover</p> <p>Theoretical: Had no prior experience of collapse or recovery and so no theoretical inputs into its management</p>	<p>Practical: Collect source code as intellectual property to form asset base for new strategic opportunities, kept business domain, website alive to show presence, maintain relationship and motivation between Founders and with released staff and future potential partners</p> <p>Theoretical: Began to study turnaround and capabilities literatures</p>	<p>Key relationships maintained for ongoing existence and re-building</p> <p>No new strategy, waiting for new opportunities and a reason that provided a means to re-build and of sufficient interest to motivate keeping going</p> <p>Operations put on hold</p> <p>Theoretical: Figure 1a</p>	<p>Behavior –began to expand the skills and activities required to match resource-collapsed circumstances and break free from routine behaviors previously enacted to conduct operations</p> <p>Attitudes – From collapse perceived as chaotic to recognizing the need to develop a set of coherent activities to deal with it systematically</p> <p>Conditions – In Crisis</p> <p>Knowledge- started to theorize about utilities as the type of activities needed by resource-collapsed firms and seen as contribution to capabilities literature. Model developed Figure 1a</p> <p>Status – Walking Dead</p>	<p>Practical: firm barely alive</p> <p>Academic: no contribution yet to academic knowledge</p>

2010	<p>Practical: Secured new financial resources New strategy of acquiring media companies Outside experts engaged to overcome resource limitations (accountants, lawyers, technology valuation companies)</p> <p>Theoretical: began remodelling the utilities construct after feedback from journal reviewers</p>	<p>Practical: As collapse ensued, focused on opportunity creation to create new strategy for firm and gain agreement among stakeholders as to new strategy</p> <p>Then worked to gather necessary resources internally and externally to pursue new opportunity and strategy</p> <p>Theoretical: Explored microfoundations literature to understand how individual actions collate into coordinated collective activity</p>	<p>Practical: New strategy, Staff and resources organized around roles needed for new strategy</p> <p>Theoretical: Utilities Concept to explain how firm recovered. Figure 1b</p>	<p>Behavior – no longer just reactive and chaotic during collapse. Action priorities became to create new opportunities, let this frame the new strategy of the firm, gain internal agreement as to strategy, salvage necessary resources for strategy and acquire those missing through external relationships</p> <p>Attitudes- Collapse no longer feared. Seen as event to create new opportunities from which new strategy can emerge and which determines resources to salvage and how to organize</p> <p>Conditions – Stable</p> <p>Knowledge- Fine-grained identification of both individual and collective elements of utilities construct. Developed Model Figure 1b.</p> <p>Status – Walking Dead</p>	<p>Practical: the firm now entered new strategic opportunities</p> <p>Academic: Figure 1b and associated paper rejected academically</p>
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<p>2012 to Present</p>	<p>Practical: Secured new financial resources New strategy of acquiring media companies Outside experts engaged to overcome resource limitations (accountants, lawyers, technology valuation companies)</p> <p>Theoretical: Abandoned utilities construct and adopted new insights from dynamic capabilities and heuristics literatures. Also adopted resilience as a lens with which to view the capability the firm was developing to manage and rebound from collapse</p>	<p>Practical: Sequenced heuristics to guide actions across four inflection points – 2 along the decline and collapse curve and 2 on the upward re-building curve. The firm learnt to identify and specify heuristics needed around strategy, resources & communications at each of the inflection points. Design new incarnation of firm for new opportunities</p> <p>Theoretical: Began researching the notion of resilience and how it relates to dynamic capabilities concept</p>	<p>Practical: Specific heuristics needed to manage distinct critical points along the U-curve of decline, collapse and re-building. This leads to resource salvaging, better identification of resources most strategically valuable, staff included in the process of collapse management, and also new firm identity</p> <p>Theoretical: Model of resilience capability building. Figure 1c</p>	<p>Behavior – action based on heuristics</p> <p>Attitudes- Collapse and recovery now seen as a resilience issue for which the firm needs a capability</p> <p>Conditions – Safe</p> <p>Knowledge- Figure 1c. Knowledge of how to build a resilience capability</p> <p>Status – Firm re-invented into new incarnation and in start-up phase</p>	<p>Practical: knowledge of resilience capability now being passed on to early-stage ventures</p> <p>Academic: Figure 1c the basis of submission as contribution to knowledge about resilience capabilities</p>
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Table 2 above shows how we combined both the program logic model and BACKS models to explicitly incorporate impact assessment into our research. First, we divided the firm's experience into three main periods where significant change occurred. These were periods of major learning and change, indicating measurable impact. These periods are shown as column one "Inflection Points in Learning" and are distinct from the three embedded cases depicted in Figure 1 earlier.

Following the program logic model we then traced inputs that refer to the available options to handle episodes of collapse. These inputs were both practical (assets, resources) as well as theoretical (what knowledge existed about collapse and its management). The "Activities" column is used to record what the firm actually did in practice to manage the collapse (labeled as "practical" in Table 2). The column also records what the practitioner members of the research team did to learn more about the management of collapse as part of the theory-building engaged scholarship process (labeled as "theoretical" in Table 2).

Outputs then show what results emerged from both the practical and theoretical activities. Practical outputs were assessed in terms of changes to strategy and operations while theoretical outputs referred to the evolving theoretical models being developed in the engaged scholarship process and are shown as Figures 2a-c. The outcomes column then records the direct impact on both the entrepreneurs and the venture in terms of the BACKS model. The "Outcomes" column lists the results from the outputs. Finally, the last column

assesses the academic and practical impacts on wider stakeholders arising from the outcomes.

The firm's first experiences of collapse (2003 to 2008) were new to it and devastating. After this collapse their practical inputs for handling it were almost non-existent except for the two surviving founders, some intellectual property, established brand reputation and a residual commitment to continue to pursue growth opportunities for the venture. These survivors had no prior knowledge of collapse or how to manage it. The activities column of the first row of Table 2 shows what the founders did to manage collapse. Further, they began taking action to study more about collapse through turnaround and capabilities literatures ("theoretical" activity). The practical activities sought to salvage some resources and led to outputs of the firm being alive but stalled, with no new strategy and operations stopped. The theoretical work yielded Figure 2a as a first attempt to better understand the theoretical dynamics of collapse and recovery based on literature insights and practical experience.

As a result of this theoretical work and the experience of collapse a number of outcomes (direct impact) began to occur. The outcomes column of Table 2 shows how theory and practice generated impact. In the first row we see that the practical activities undertaken to manage collapse were basic, reactionary, and fearful. But the theoretical activities and outputs led to new learning about how to manage collapse. This is recorded in the outcomes column in the form of changes to behavior, attitudes and knowledge. These were beneficial impacts to the entrepreneurs. Figure 2a represented an early stage in sensemaking and helped to

organize survivor thinking about collapse and how to manage it; a step beyond their previous lack of any coherent knowledge. At this point, little beneficial impact had accrued to the firm which remained “in Crisis”.

The second row of Table 2 records further beneficial impact from the theory/practice exchange, as the firm experienced subsequent episodes of collapse and trialed various counter-measures based on their evolving theoretical frame. The firm had revived from two successive collapses in the period 2003-08 and had acquired new resources. After re-strategizing the firm again faced collapse. During the second episode, survivors had evolved their management orientation to embrace utilities that would hopefully position the firm for better recovery.

This orientation embraced the concept of utilities, defined as the set of coherent activities which collapsed firms must engage to lessen decline and enhance recovery. With this experience of collapse combined with a rejection of a paper outlining an early rendition of the utilities concept, Figure 1b emerged as a stronger, clearer enunciation of the process of managing collapse with utilities. This figure guided the practical activities in row 2 of Table 2.

The breakthrough of Figure 2b created various BACKS impacts. Cognitively and behaviorally, the survivors reported no longer fearing collapse and instead embracing it as an opportunity-creator enabling new strategy to emerge. This insight led to survivors prioritizing resources for salvaging because of their fit with the emerging opportunities and strategy. As the firm entered a period of stability, as indicated in Figure 1 by capabilities above the threshold of stability, survivors perceived they were less vulnerable to collapse.

However, while impact was perceived in practice, the model of Figure 2b and the construct of utilities had failed to gain traction academically, being judged insufficiently distinct from a dynamic capability (Helfat & Peteraf, 2003). This challenge motivated an excursion into dynamic capabilities literature in order to find a more robust academic contribution. This excursion unlocked a new significant wave of insights that generated greater theoretical and practical value that translated into BACKS impact. Figure 2c emerged as the new theoretical frame and offered deeper guidance to managing the collapse process through heuristics. The firm improved from 'stable' to 'safe' on the condition continuum and experienced the transformation of its collapse into a new incarnation of the firm. This was due to the effective management of resources during collapse but also its opportunity creation re-orientation. By casting the navigation of collapse as a resilience capability, as embodied in Figure 2c and captured in the third row of Table 2, a sufficiently robust model had been distilled that may inform other entrepreneurs.

4.6 CONCLUSION

This is a story of how theory and practice were intertwined to create impact in the form of a contribution to the actual life of entrepreneurs surviving adverse conditions. This impact induced changes in behavior, attitude, condition, knowledge and status, underscoring the value of engaged scholarship research in the overall portfolio of research tools for the management sciences. Our research approach not only adds to the comparatively few examples using this method, it demonstrates how new theory was built and the arising hurdles addressed.

The delve-test-innovate-unlock process for theory-building helps researchers to deliver real time assistance through case study. Our experience of academic and practitioner synergy differs from arguments about zero-sumness (Kieser & Leiner, 2009, 2012). Delivering real time assistance to a struggling firm was neither separated from theory building, nor was the process a linear evolution. The two were iteratively intertwined such that our ability to offer useful and important practical value was directly correlated with the quality, robustness, validity and reliability of our theory-building.

Thus, a core feature of our experience was the common value attributed to theory-building by both researchers and practitioners. Practitioners sought to develop theory that assisted them in achieving their goals while the academics sought theory that contributed to management science as judged by their peers. In this sense, our arguments may be limited to those academics capable of selling and teaching theory-building and those practitioners motivated to learn new theory-building skills. We encourage a generation of researchers and leaders in business schools to nurture these methods towards rigorous research that delivers impact with assistance in real time.

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Preface to Chapter 5

Introducing the Collapse Trap

To review, Chapter 1 positioned the experience of collapse to address an overall research question of building capabilities in resilience. Chapter 2 then outlined the conceptual framework of the resilience construct. This analysis then formed the basis of an empirically derived modeling of heuristic based capabilities and how these enabled resilient organizational actions. Chapter 4 then developed the findings from the empirical case using an engaged scholarship framework, again building theory for the process of resilience capability through heuristics as this applies to firms navigating strategic and resource collapse. Chapter 5 now adds to this, applying a different lens to this data to explain the steps managers can take when seeking to break a cycle of instability, to address the research question: *how can organizations remain capable when their capabilities are gone?* This cycle breaking outcome is described as escaping the collapse trap, a phrase perhaps more resonant with practitioners who live with the consequences of set-backs. The focus lies in iterative sequence of actions taken as the firm pre-emptively dismantles capabilities as resources decline, survives collapse of resources allowing other assets to come to the fore and then forms and develops new opportunities through collective actions from individual competency. The chapter has been published by Wiley in *Strategic Change: Briefings in Entrepreneurial Finance*, appearing in the July 2015 special issue on new strategies for innovative performance.

CHAPTER 5 | ESCAPING THE COLLAPSE TRAP

Remaining Capable Without Capabilities

ABSTRACT

Resilient firms need to maintain function even while under duress, both with routine actions and when routines collapse. Capabilities are those bundles of activities that organizations do really well and can give them a competitive edge, but what do you do when they are shattered by adverse environmental shocks? Our longitudinal case study of a firm that experienced three episodes of decline and collapse reveals a particular sequence of actions that managers need to learn in order to survive, even grow, from collapsed capabilities. We find that firms that do not acquire skills are likely to get stuck in a collapse trap and that liberation comes from harnessing the unstable activities used to purposefully dismantle and rebuild capabilities under high-risk and volatile conditions.

5.1 INTRODUCTION

Old wisdom says that real strength is shown in times of weakness when relied-on sources of strength are gone. Such wisdom speaks to resilience – remaining capable even when things seem incapable. Our focal case study of real time decision-making through cycles of success and failure within ActiveSky over the last fourteen years indicates that resilience is critically important for organizations and managers as well. How can organizations remain capable when their capabilities are gone?

ActiveSky is a technology company founded in 1999, at the height of the dotcom boom. At founding, it offered a radically new and capable platform for handheld wireless devices to send and receive interactive content over the air, enabling services that, at the time, were only dreamed of. When handheld devices could typically garner processing speeds of no more than 5 MIPS (millions of instructions per second, compared to 400MIPS or greater today), the ActiveSky platform was able to deliver functionality for online forms, audio and streaming video. The market interest in this capability was intense and ActiveSky successfully raised considerable venture capital investment to fund a rapid and ambitious expansion. In addition to its head office in Silicon Valley, within a year it had opened two technology development facilities in Australia, a sales office & product testing facility in Japan and a sales office in UK.

But the growth didn't last. ActiveSky was hardest hit by the volatility of a still forming wireless marketplace with fickle customer loyalties as new products hit the market and the consequent unstable and insufficient cash

flows. The firm found itself continually re-directing its resources, always catching up to implement some latest, desired feature set. By 2003 they were well into decline with a series of staff retrenchments. By 2004, they collapsed. But against all odds, they rebuilt only to collapse, rebuild and collapse again. They still survive today and their lessons offer hope to those who would like to be freed of “living dead”¹ status (Bourgeois & Eisenhardt, 1987).

We have studied this firm throughout its entire history as a longitudinal case. We were fortunate to be amongst the principal decision-makers as they faced the tough choices concerning their survival and rebuilding through three sequences of collapse. What made this case particularly instructive was that these principal decision-makers were also reflective practitioners. They were aware of existing concepts in management literature that could possibly offer some help like turnarounds, capabilities, and bricolage (examples are Arend, 2008; Arikian & McGahan, 2010; Baker & Nelson, 2005;). But despite various attempts to apply these methods during troubled times, such constructs didn't specifically address their peculiar set of circumstances: strategic and resource collapse. They had no or few discernable resources and no stable or optimal routines, so could not have capabilities as this construct is commonly defined (Nelson & Winter, 1982). Despite a keen desire to turnaround the failing fortunes of the firm, none of the attempts appeared to work and just making do with what they had to hand didn't fit comfortably with where the survivors aspired to be. Our quest then became to make sense of the path followed by

¹ The living dead label refers to those firms that neither achieve great growth and high valuation nor fail outright, as perceived from the venture capitalist point of view.

this firm through engaging with key decision makers and to contribute to our knowledge about how firms facing adverse conditions can manage with and without capabilities. Sensemaking is a process of understanding the actions undertaken by a firm after these have occurred (Sandberg & Tsoukas, 2014) which we coupled with both real time and retrospective analysis.

In pursuing this sensemaking goal, we observed an iterative sequence of focal actions that indicates a possible approach to escaping a collapse trap and to rebuild capabilities. Capabilities are established activity and resource utilisation routines that reliably produce positive and desired outcomes for a firm (Helfat et al., 2007). They are mainly applicable in circumstances of strategic coherence, resource sufficiency and operating stability. When strategic and resource collapse occur through the impacts of adverse conditions, capabilities vanish and we identify a different, fragile yet effective, set of activities as being more appropriate. These unstable activities are used to purposefully dismantle and rebuild capabilities, intended as an antidote to often panicky, chaotic and reactive decision-making which can occur in times of serious distress. Instead, we identified those actions that re-focus the managerial team to undertake a staged capability dismantling sequence, serving to prime the firm for better re-building. In the process, a firm able to apply such actions enhances its resilience to further adversities that will impact upon it at later times. Those that do not develop these skills are more prone to remain in the collapse trap, unable to manage without capabilities.

Next, we present our research method before outlining ActiveSky's successive phases of collapse and re-building². We then use the case data to show how existing literature fails to inform managers on escaping the collapse trap and how such actions enhance resilience.

Box 1

What is Collapse?

By collapse we mean a situation where the firm has lost its vital strengths for capable action. In particular, we see two key sub-types - strategic and resource collapse - that form a sinister recipe if they occur together. Strategic collapse is characterized by a paralysis of action as intended organizational goals are ambiguous or unfulfilled, capabilities have disintegrated and key product-market strategies have failed to secure growth. In addition, there may be considerable fallout and dissension among the principal decision makers contributing to a lack of coherence about future objectives and how best to achieve them. Resource collapse is characterised by key assets becoming either unavailable or difficult to access in the near-term, rendering the firm unable to sustain the routines of resource use that have to date enabled them to achieve operating objectives. We suggest that this particular combination of strategic and resource collapse calls for particular skills in capability dismantling and rebuilding in order to avoid death but also to position for strategic renewal.

² We are not suggesting that ActiveSky is a role-model for dealing with strategic and resource collapse; the firm made mistakes in strategic choices and execution of worthwhile strategies. We are offering these focal action sequences to indicate alternative choices to the dissolution of the firm, outlining real and specific steps for actors who remain committed to the firm's prospects and so to allow them to realise the best outcomes from a fraught situation.

5.2 THE RESEARCH

Since the available constructs seemed not to provide useful remedies for the issues our case experienced, we set out to build new theory to show how firms can survive without capabilities after devastating strategic and resource loss. Our theory-building objectives occurred within the paradigm of engaged scholarship, which is *“a collaborative form of inquiry in which academics and practitioners leverage their different perspectives and competencies to coproduce knowledge about a complex problem or phenomenon that exists under conditions of uncertainty found in the world”* (Van de Ven & Johnson, 2006: 803).

The knowledge-in-practice of the practitioner offers context-specific tests of rival hypotheses while the more detached academic converts knowledge-in-practice into rigorous, more generalizable theory. Engaged scholarship thus is a means for synthesizing complementary and pluralistic views of a given reality and for achieving aims of rigor and relevance. Synthesis is achieved through a strategy of arbitrage – dialectical debate and conflict which triangulates on a phenomenon and from which a more robust synthesis can emerge. A key goal is the generation of robust theoretical explanation with knowledge co-production observing a number of practices through an iterative cycle of problem formulation, theory building, research design and problem solving.

First, engaged scholarship is best suited to “big” research questions that are grounded in reality and whose complexity demands multiple perspectives. We have done this by focusing on a pervasive problem – how can firms survive

and recover from severe adversity given that adversity is somewhat inescapable. Second, the research project should be designed to be a collaborative learning community between academics and reflective practitioners. Third, the study should be designed for an extended duration to allow for more time on-site, reflection, data gathering and observation across time. Our research design involved real time data collection, field observation and theory-building arbitrage over a fourteen year period. Fourth, is the need to employ multiple models that offer competing plausible explanations of the phenomenon. For this reason, our study compares routine-based capabilities, bricolage and turnaround explanations for how firms survive and recover from strategic and resource collapse.

We sought to achieve our theory-building goals by deploying engaged scholarship through a modified version of a traditional case method (Eisenhardt & Graebner, 2007; Siggelkow, 2007). The reflective practitioners brought both real time and historical insights about their work context under severe resource constraint and were able to trial, in real time, various activity options suggested by the literature through learning-by-doing. This sharpened the assessment of existing concepts such as routine-based capabilities, turnaround strategies, and bricolage as suggested by academic literatures. But the richest results were achieved as each participant, academic and practitioner, engaged in arbitrage within their own evolving understanding of the phenomenon. We believe that if we had have remained as detached academics we would not have engaged in as rich a theory-building experience.

Sample and Data Collection

Our focal case afforded us deep, privileged access to real time, longitudinal decision-making, representing a rich opportunity in decline-turnaround research. It is usually difficult for researchers to identify and track collapsed firms over time because the business may have been liquidated and the people moved on. Other researchers also have yielded rich breakthroughs on account of deep, privileged longitudinal data access from a focal case to expose obscure or hidden capabilities (Salvato, 2009).

Data was systematically collected from a number of sources and these sources differed across the three cycles of decline, collapse and rebuilding. Overall, the authors undertook a total of 126 interviews across eight informants, iterating between interviews, data analysis, theory-building and some theory testing. From the point of strategic and resource collapse we asked the remaining few survivors (hereafter, 'survivors') of the firm to keep daily diaries. We had unlimited access to these diaries.

These survivors participated to varying degrees in the capability development efforts from inception. In the process of theory-building, we triangulated diary entries and other written material with interview data. In terms of historical chronology the diaries were remarkably similar, with differences in emphasis on the impact of particular events. This resulted in a relatively easy correction of differences, lending confidence that we had reliable data. From this data, we were able to delineate ten distinct phases, framed in

terms of its organizational performance and the capabilities that enabled such performance. We give a brief summary of these phases in Box 2.

Theory-Building Through Arbitrage

Theory-building proceeded by the researchers and the organizational actors collaboratively testing various literature-based activity options. Testing of theory by actors involved not only becoming familiar with the relevant concepts but also accepting/rejecting the merits of each based on reasoning and/or practical application. Actors became familiar with theory about routine-based capabilities by studying seminal articles in the resource-based view and organizational capabilities literature sets.

Turnaround strategies and bricolage literatures were also examined and tried in practice. Our derivation of definitions, sources, key components and limiting assumptions resulted in Table 1. We observed key commonalities among the range of different tasks that were required. This commonality emerged from the constraints imposed by strategic and resource collapse. Table 1 outlines how the observed actions appeared to be distinctively different to other constructs.

Box 2

The Ten Phases of ActiveSky

Early Stage Growth (1999 – 2003)

- Received investments, established 5 offices in 3 countries, applied resources to technology & business development capabilities, changed core strategy 3 times, launching interactive streaming video trails and live deployments in 2 countries marking key capability milestones

Decline 1 (2003 – 2004)

- Failure to leverage more licence revenues, cost cutting, resource retrenchments

Collapse 1 (late 2004)

- Surrender of the firm by investors to survivors

Creating New Opportunities 1 (2005)

- Retain former strategy, agility in seeking new revenues, building new commercial skills, formation of acquisition process by matching industry player

Decline 2/Collapse 2 (early 2006)

- Failure of acquisition process, 2nd opportunity chased, new aligned interests

Creating New Opportunities 2 (2006 - 2007)

- New IPO strategy built on retained reputation & know-how

Rebuilding Capabilities as Resources Accrue 1 (2007)

- Lay down activity patterns to secure IPO, using partner firm resources

Decline 3 (2008)

- GFC destroys ability for funders to support IPO, no opportunities can be

Table 1: Activities relevant to Collapse

Activity Type	Definition	Core Components	Dominant Logic	Typical Environment	Limitations
Routine-based Capabilities (Arikan & McGahan, 2010)	Repeatable processes involving collective action above a certain threshold of functionality	<ul style="list-style-type: none"> • Cognitive framing across hierarchy • Routines • Integration mechanisms 	Commitment, leverage, efficiency	Stable to moderately dynamic	<ul style="list-style-type: none"> • Threshold level of resources required for capability leverage and replication • Assumes stability and strategic coherence across organization levels to know what capabilities need to be developed
Organizational Decline (Carmeli & Schaubroeck, 2008)	Sustained reduction in firm's performance caused by operational & strategic problems	<ul style="list-style-type: none"> • Operational problems • Strategic problems in a given environment 	Devise recovery strategy	Moderately dynamic yet sufficiently stable to allow for firm recovery	<ul style="list-style-type: none"> • Focus on recovery of former performance levels rather than a new strategic & operating configurations implying new resource sets and new routines of utilization & growth
Bricolage (Baker & Nelson, 2005)	“making do by applying combinations of the resources at hand to new problems and opportunities”	<ul style="list-style-type: none"> • Making do • Combination of resources for new purposes • Use resources at hand 	Invention to achieve more from less	Resource constrained	<ul style="list-style-type: none"> • Invention also needs strategy • Ignores how executing strategies also requires resource acquisition not just ‘making do’
Turnaround (Arogyaswamy, Barker & Yasai-Ardekani, 1995)	Convert decline into enduring success through strategic & operating changes	<ul style="list-style-type: none"> • Seek to recover from decline below historical levels of performance back to a firm's equilibrium state 	Response to & transition from adverse conditions	Adverse event in an otherwise stable operating equilibrium	<ul style="list-style-type: none"> • Regards decline & turnaround as single trajectory whereas multiple, interacting paths commonly interact • No focus on building resilient capabilities to enable an enduring success with future shocks

<p>Observed Actions in this Research</p>	<p>Non-routine activities in unstable operating conditions during strategic and resource collapse.</p>	<ul style="list-style-type: none"> • Dismantle existing routines to enable future rebuild • Improvised and opportunistic resource rebuilding & configuration towards new strategic foundation 	<p>Deliberate dismantling then rebuilding of resources & patterns of activity</p>	<p>Strategic and resource collapse after adverse discontinuity during operating instability</p>	<ul style="list-style-type: none"> • Key decision makers prepared to function below operating stability threshold, persisting with shared perception of future value conditions • Creation of strategic value driven by recognition & exploitation of exogenous factors by survivors • Entrenches reactive variability when resources become stable
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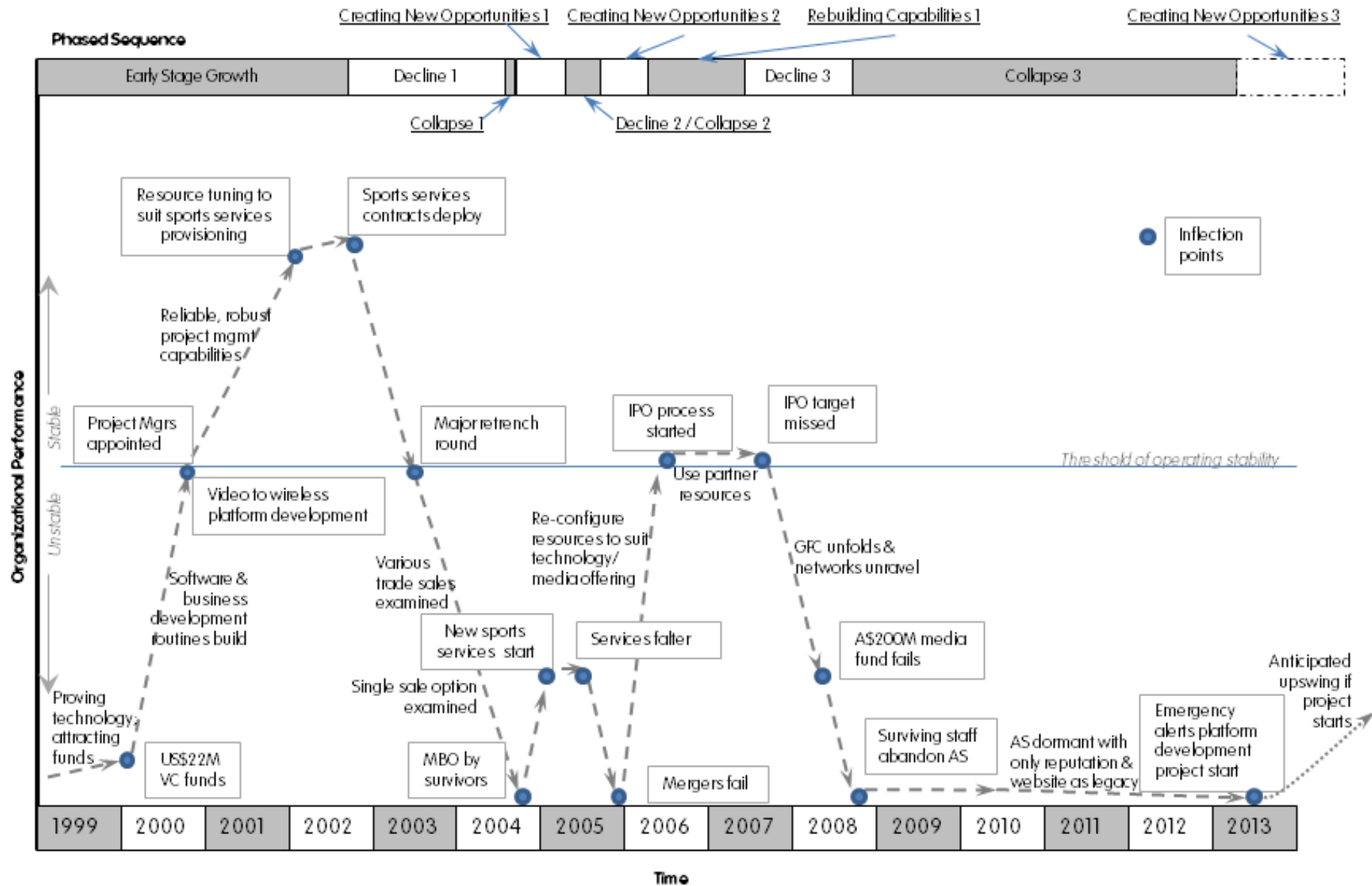


Figure 1: Timeline of ActiveSky viewed through a capabilities lens and expressed in terms of its organizational capabilities, showing key inflection points as large dots and brief descriptions of various phases of growth, decline & collapse. Note the 2 periods of operating stability (2001-2003 and 2007) where capability (re)building occurred.

5.3 ACTIVESKY: CYCLES OF DECLINE, COLLAPSE AND REBUILDING

By using a capabilities lens, this longitudinal case allows us to represent adverse impacts in 3 different phases, distinguished in terms of an overall capability (or lack thereof) to exploit available resources to deliver reliable outcomes. We label three distinguishing phases as decline, collapse and rebuilding; these phases are briefly listed in Box 2 and conceptually represented in Figure 1. Each phase corresponds to periods of either reduction in organizational performance (decline), a sustained low level or zero reliable performance (collapse) and periods of increasing organizational performance (rebuilding).

Our case data shows that during phases of decline, shown by successive downward gradients in Figure 1, an evolving pattern of behaviours and activities occurred. Triggered by the failure of the initial business model, the first decline sought to retain as many resources as possible with a view to “recovering” back to the type of operating stability³ that had occurred prior to the onset of decline. The use of the term recovery is instructive as it arises in turnaround literatures and suggests a view, derived in hindsight, of returning to former levels of resourcing and generally along the lines of the previously existing strategy (Arogyaswamy, Barker, & Yasai-Ardekani, 1995).

During the Decline 2 phase, the key decision makers had learned from the experiences of the previous decline, recognising that recovery may not be possible and

³ We define operating stability as a threshold of reliably exploiting resources through routine behaviour to achieve a desired outcome. Falling below this threshold means the firm can no longer reliably achieve desired outputs from these routine patterns of action.

so, as a fresh approach, chose to consciously focus on building multiple opportunity paths to be exploited across a range of contexts (Barker & Duhaime, 1997). When the preferred opportunity collapsed unforeseeably, they retained two other options, each of which could have worked for the firm as it stood at that time. The insight to be gained here is the development from an historical “recovery” focus into a more future-oriented “opportunity development” focus which involved a change in how they managed collapse and planned for the future.

During the Decline 3 phase, the key decision makers chose for the first time to focus on pro-actively removing resource-consuming assets rather than waiting for them to collapse. They initiated a release of all assets that consumed resources of labour, attention or cash, such as the IP portfolio, office space and paid staff, but actively retained those few resources that could possibly withstand collapse, such as historical reputation, the company’s domain name and stored archives of the platform source code. They judged that these low-resource consuming elements would yield an essential contribution should more favourable conditions arise at some later time, enabling a renewal. The key decision makers here learned that resources are not all created equal in terms of their resilience, a point we return to in more detail later.

Following these multiple decline phases, our data shows three periods of collapse, the last occurring over a prolonged period. Collapse 1 was largely pre-empted by the survivors, even encouraged, as a way of leveraging the legal assets of the firm from the control of the original investors. It is a powerful yet high-risk approach, to deliberately invoke collapse to achieve full strategic & operating control, quarantined from domination by parties external to the survivors. Yet in this case, it worked.

During the unforeseen Collapse 2 phase, the surviving members had anticipated some shocks, although not the particular shock that caused collapse of the resources they had begun to accumulate. Accordingly, they had begun to accrue an array of opportunities that could be invoked, to various benefit profiles. Because they had invested in this effort, as well as the coherence of the surviving team and building trust between these survivors, they could collectively adjust to a radically new and hitherto un-envisaged strategic direction. Collapse 3 demonstrates how successfully the strategy of stripping resource consuming assets has worked, in sustaining an apparently resource-less firm for an extended period.

During the New Opportunities 1 phase, the survivors cohered around a single strategy that was largely based on re-creating earlier operational norms but without strategic interference from other parties. The collective coherence was a continuation of this earlier experienced buoyancy. New Opportunities 2 showed a coherence around an entirely new strategy, the IPO, made possible by the attraction of new skills into the surviving team that deepened network & commercial resources. The impending New Opportunities 3 phases is derived from a single project opportunity but the survivors have been able to create a sustainable collapsed configuration that, while the value of these assets attenuates over time (that is, a decay in historical reputation from earlier successes, technical know-how in the wireless space, connections into an array of commercial projects that could possibly yield as yet unformed growth opportunities for ActiveSky survivors) has proven to be a sustainable collapsed state, without dissipating entirely the possibility of renewal and rebuilding.

5.4 INADEQUACY OF EXISTING CONCEPTS

Interesting findings emerged as we tried to explain the above patterns using existing concepts from the management literature. Table 1 lists the various concepts that were considered throughout our research and what we learnt about the boundaries of their usefulness to explain and predict in the circumstances under study.

Bricolage captured aspects of the mindset and action required when both decline and rebuilding were underway. Bricolage called attention to the need for resourcefulness, for discriminating between the usefulness of various resources, of the need to discard some and salvage others (Baker & Nelson, 2005). However, the concept of bricolage was not enough to capture the management approach required. In particular, bricolage does not capture the purposeful and staged way that capabilities were dismantled during decline nor the purposeful and staged way that capabilities were rebuilt to realise an aspired strategic goal.

Routine-based capabilities were not an applicable concept because there were none. Critical capability conditions of strategic coherence and resource sufficiency to maintain a level of operating function were not present. We needed to figure out how the firm could get back to this position. Much of the capabilities perspective is focused on reconfiguring existing resources and does not address what actions help once resources have collapsed and capabilities cannot be sustained (Helfat & Peteraf, 2003). Using this perspective there can be no recovery from collapse, so the survivors in 2004 would have walked away and further renewal attempts abandoned.

Finally, if they had adopted a turnaround perspective, they would have retrenched resources during the Decline 1 phase and could have sought to renew the

firm's strategy using existing networks of investors and alliance partners (see for example Lohrke, Bedeian, & Palmer, 2004). This approach would have left the existing strategic control framework in place, yet may have worked. The founders took a gamble that by riding through collapse, they could accrue full strategic control for themselves, which they perceived as a requirement to tackle future, as yet unknown, adverse conditions.

5.5 COMMON FLAWED REACTIONS AND THE COLLAPSE TRAP

We argue that the repeated cycles of decline, collapse and rebuilding in ActiveSky, without sustainably achieving stability, show a corrosive condition that becomes increasingly harder to sustain over time. We call this condition a collapse trap; an extended state where “escape” into conditions of strategic cohesion and resource sufficiency above a threshold of operating stability are elusive. A collapse trap can occur when firms fail to learn from decline and collapse and so fail to initiate key actions that could indeed lift the firm back on a path of more stable resources and routines into capability development, when opportunities are created.

Existing in the collapse trap indicates that survivors may have failed to learn to dismantle resources and survive a collapse episode in a way that facilitates rebuilding should opportunities emerge. The collapse trap may also result when firms have pursued ad hoc approaches to stemming resource loss during decline and so reach a plateau of near-death existence but without the pre-conditions for re-building. That is, capabilities have not been purposefully dismantled during decline and so a useable seedbed for capability rebuilding has not been established. As such, a key determinant

for remaining in a collapse trap is managerial error, often in the form of inexperience with managing decline or fear of collapse itself.

Table 2 below highlights some of the common actions undertaken during decline recovery or reversal attempts and the various assumptions that apply. These actions and assumptions constitute the condition we label as a collapse trap and are derived from the ActiveSky data as it navigated repeated cycles of decline, collapse and rebuilding.

Next we outline how this model invites a different set of actions and assumptions to those currently offered by the strategic choice based turnaround models, synthesizing the various lessons learned by ActiveSky decision-makers based on their various decline and collapse experiences and the actions that led to capability rebuilding. This process involved changes in how they viewed the collapse experience and the ways that action needed to be taken, to overcome the limitations of the existing conceptual repertoire in the management literature related to dealing with organizational decline.

5.6 PURPOSEFUL MOVES IN COLLAPSE

The U-model (Figure 2) illustrates actions purposeful dismantling and rebuilding of capabilities on either side of collapse. Importantly, the U-model depicts a line of operating stability above which capabilities are possible but below which requires a different activity sequence. Existing capabilities literature has traditionally focused above the line carrying an in-built assumption of strategic cohesion and resource sufficiency characteristic of relatively stable circumstances.

Table 2: The Collapse Trap: Flawed Actions and Flawed Assumptions

Flawed Actions	Flawed Assumptions
Attempt to survive by recovering resources to resume existing strategic goals	Resources can be recovered and so existing strategic goals can remain intact
Devise new strategy based on existing resources	Existing resources can deliver new strategic outcomes and so remain relevant or activated for long enough to realise new opportunities
Attract new resources into existing base to achieve new strategy	Newly attracted resources can fit into existing activity mix, without asymmetries, and be controlled with existing structures
If recovery attempts fail to reverse decline, its time to dissolve the firm	Collapsed firms have no resources to maintain action and dissolution is the only option
Fear of dissolution drives increasingly frantic attempts to secure any opportunity to regain operating stability	Survival in a state of depleted or no resources can only be sustained for a limited period before dissolution occurs

Our contribution, illuminated through the ActiveSky case, is to expose the subterranean area below this threshold. The U-model depicts the descent of decline on the one hand, followed by a possible period of flat-line risking dispersal into non-existence and, if antecedents are in place, a possible upswing towards new capability development. Whether a firm’s path is a u-shape and regains stable resources or fails to climb above the threshold of operating stability is captured in our figure by two loops.

First, a meta-loop which captures how firms seek to escape the collapse trap and ascend to capability rebuilding. Second, an iterative sub-loop which illustrates a condition of remaining in the collapse trap. We argue that firms caught in this loop have not engaged the correct activity sequence during decline so as to increase their chances of capability rebuilding. We now look at each side of this U-model to more closely identify the key priorities for building organizational resilience.

Transitioning to a State without Capabilities

Noteworthy during decline is that the firm is experiencing shattered capabilities – activity sets which presume strategic coherence and resource sufficiency. Our analysis of what went wrong, what worked and what could have been done better in the ActiveSky case shows that managers must rely on a more dynamic set of capabilities, that embrace dismantling and focus on rebuilding. These non-routine activities are required so that strategic and operating tasks can be undertaken in an unstable environment during strategic and resource collapse.

These fragile processes are based on unstable assets and activity sets around strategic actions yet to prove their worth. By way of example, the recruitment of experienced project managers in the early stage growth phase marked a keen aspiration to achieve reliable performance outcomes with stable routines. Conversely, the idiosyncratic and fragile combination of skills and learning rates applied as the firm sought to gain public listing proved sufficient for that context but was hardly sustainable nor reliable over time. These actions are underpinned by resilience – both personal and organizational - whereby the firms' decision makers are intent on growing from adversity. They also have a strategic orientation – the firm's managers are not making ad hoc decisions based on short term panic but rather through envisaging a new strategic future which requires the laying down of a resource-opportunity platform. We observed three focal steps during dismantling and a further three focal steps as the firm gained sufficient traction to re-build.

Actions for Capability Dismantling

Analyzing how ActiveSky learnt to manage the decline phase highlights three key actions involved in purposeful capability dismantling, each becoming more relevant as decline ensues. These three actions cover routine reconfiguration, retaining resilient resources and consolidating strategic control and coherence.

Routine Reconfiguration to match changing resource base Entering the fragile zone below the level of operating stability need not be obvious. Our case shows participants at ActiveSky seeking to deal with continued decline in the first such phase by reconfiguring remaining resources to patch up the service gaps that arose as apparently random gaps emerged. This action was particularly evidenced in customer services, where a national helpline for the sports services deployment in the US was diverted through to a single mobile phone carried by one of the staff, effectively providing around the clock support for 40,000+ end users in a bid to appear more stable than they really were. This is a reasonable first step in response to loss of resources but will prove insufficient if decline continues; the gaps open up faster than the reconfiguration process can match with the remaining (and increasingly unstable) resources.

Actively retain low resource consumption baseline After successive decline episodes, the survivors at ActiveSky learnt to recognise the conditions of operating instability, so when they entered the third decline sequence, they learned that reconfiguration would be a futile activity. They actively sought to strip those resources that consumed other resources to remain viable. Rather than assuming dissolution,

they chose a small number of assets (legacy reputation, strategic insights into the wireless space and a small number of closely held commercial relationships) that could be retained in an otherwise resource-less state and jettisoned other resource-consuming assets. This revealed the insight that some resources are more resilient than others and knowing this difference can significantly affect the path of collapse and/or recovery. The IP portfolio is a clear example of this active selection and jettison process. We argue that if the survivors had learned this focal activity sooner, they may have retained more resources and been able to create more opportunities at successive rebuilding sequences.

Consolidate Strategic Control to create new opportunities The ActiveSky survivors were hampered by the interference in setting new strategy by parties remote from the operations but retaining some level of residual control over the choices the firm could make. The angel investor from 1999 still sought to exert influence over strategic choices in 2007 as the firm was preparing for IPO. Once that rebuilding attempt collapsed so too did that interference.

We draw from this a lesson that navigating the unstable disquieting space of strategic and resource collapse requires control for the strategy to be held by the survivors; the people at the coal face making the key decisions that impact on how the firm dismantles and then how it rebuilds. This control includes the freedom to make mistakes and to learn from those mis-steps.

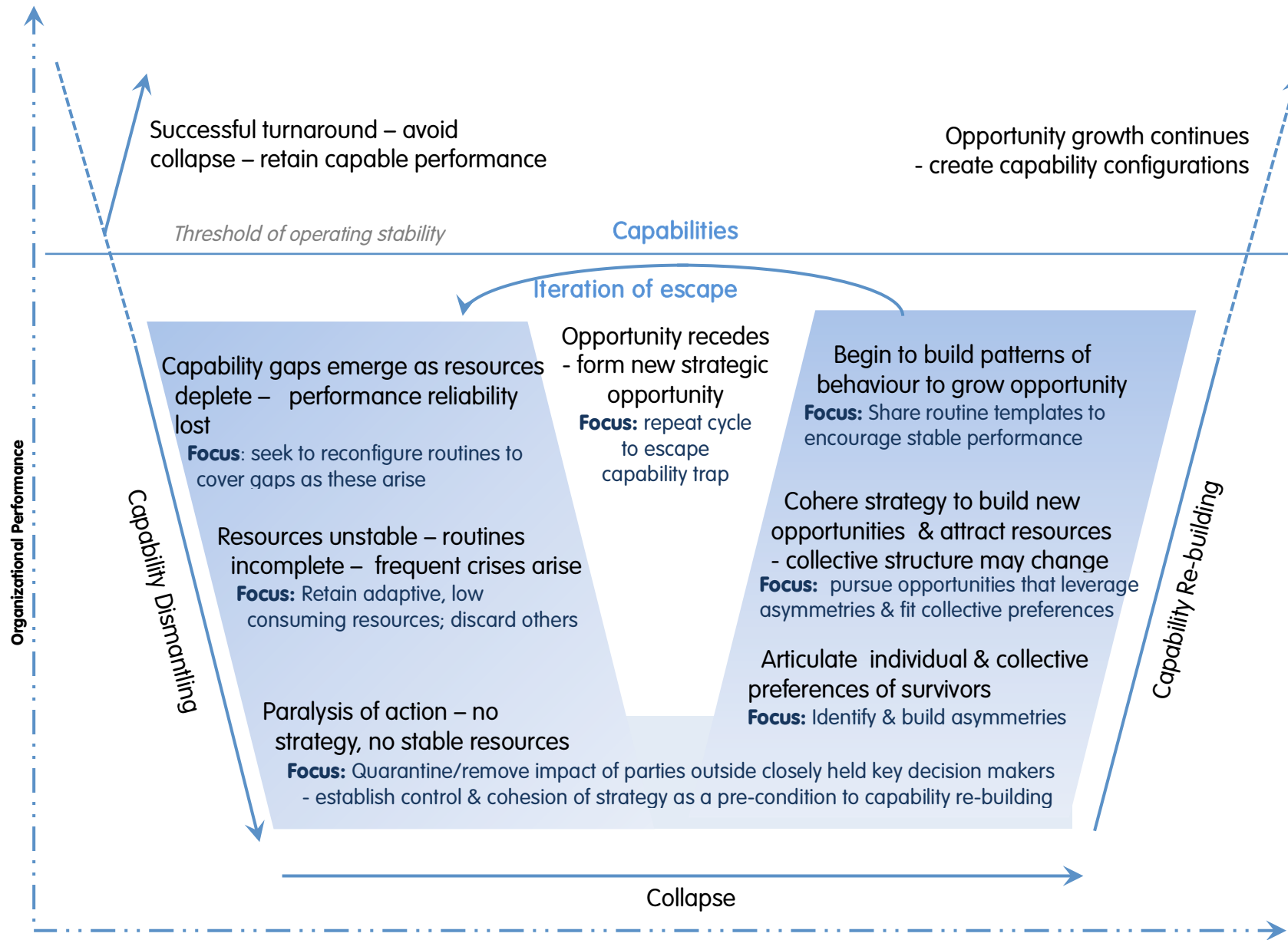


Figure 2: U-model schematic showing an iterative capability dismantling-collapse-rebuilding cycle, with observed focal actions during dismantling and rebuilding phases, functioning below levels of operating stability.

Box 3**What are resilient resources?**

Circumstances of strategic and resource collapse teach us something new about resources not currently taken account of in the popular resource-based view (Helfat & Peteraf, 2003). Some resources, including many popularly thought of as the firm's strategically most valuable, are co-dependent. That is, they rely on other resources for their sustenance. A good example is a patent portfolio – these are expensive to establish and maintain, while their commercial benefits to the firm are questionable in the short term and rely on a deep resource base, of cash and alliances, in the long term to gain strategically valuable returns. Yet many firms facing recurring adversities regard maintaining the patent protections they have in place as top of their list on which to spend any scarce funds. Circumstances of strategic and resource collapse throw this co-dependence into the spotlight as the firm's previous strategically-most valuable resources become unsustainable due to co-dependent resource depletion. Resilient resources are those that not only demonstrate low or no co-dependencies, but also can be sustained during a period of strategic and resource collapse, as well as being able to lead strategic and operating recovery. In our ActiveSky case, the most resilient resources proved to be the surviving members themselves, since they could adapt sufficiently and in the requisite timeframe to the adverse forces acting on the firm through its various phases of decline, collapse and rebuilding. The patent portfolio, the trademarks, the hardware, even the source code itself proved increasingly irrelevant as serial new opportunities were created.

Transitioning back to capabilities

Continued resource loss epitomises decline and resource-less-ness epitomises collapse. In this sequence, we argue that a deliberate dismantling process can put the firm into a position where strategic focus is ultimately stronger, positive rebuilding is easier and successful capability construction more likely as opportunities are created. Yet the inverse of this path, back to capabilities, has its own challenges, since resources remain unstable and the strategic promise has not yet been proved; it remains an aspiration.

Actions for Capability Rebuilding

We outline below 3 steps that are key to rebuilding capabilities, embracing asymmetries between survivors, coherent strategy and the seeding of repeatable activity patterns.

Identify asymmetries and build a functioning collective Before rebuilding can begin and even before opportunities can be created or assessed, the surviving individuals need to have some sense of how they will work together. Since the firm is inherently unstable, this step is critical towards enticing a collective that can function effectively towards whatever shared goals may emerge. A dominant individual imposing their worldview on a surviving team will be insufficient, even destructive, to the formation of a functioning collective. So identifying what each survivor seeks to get out of the venture by maintaining their commitment and recognising that while this outcome may not be achieved at least each can engage in activities they enjoy is a crucial first rebuilding step. The focus here is not so much to lay down efficient

activity patterns as to identify the limits and requirements that apply to each survivor and devise activity sets that allow these various asymmetries to function to some degree of effectiveness (Miller, 2003). It is because of this requirement to accommodate individual asymmetries that the survivors need to have full control over their own strategy setting agenda⁴.

Cohere strategy Creating a coherent new strategy from a base of collapsed resources with a fragile collective that may be struggling to incorporate an array of incompatible asymmetries is a big ask. Yet it forms a critical step in the rebuilding process, if the surviving firm is to escape the fragility of its resource collapsed state and have a chance at achieving some level of stability and reaching its goals as a capable firm with sustainable long term prospects. Whether an attractive and viable strategy is discovered from existing options or created by novel combinations of current and yet to be secured options is less critical than the survivors cohering around an agreed strategy, working towards that shared goal and cycling through this process as many times as needed in order to sustain a prospect of rebuilding.

Share repeatable patterned actions As opportunities gain momentum and survivors embrace the shared benefits that successful implementation may bring, they need to lay down repeatable patterns of actions as they collectively build standard responses to frequently arising requirements. Given they still lack resources and the opportunity allows them to attract otherwise unattainable resources.

⁴ Incorporating the individual differences and preferences to build a functioning collective, that is embracing asymmetries, implies that a smaller team will be more viable to rebuild from collapse than a larger surviving team, although insufficient data has been collected in our studies so far to nominate preferred surviving team size.

5.7 RESILIENCE PROOFING

We stress here that our U-model is dynamic over many cycles, not necessarily for just one cycle of capability dismantling and rebuilding. This multi-cycle capacity is shown by our data. It is a sequence of focus and action to be mastered and improved each time strategic and resource collapse may ensue. This cycle has the effect of building organizational resilience to withstand and grow from repeated shocks in the future, as key decision makers and managers lessen their vulnerability to the excess volatility that collapses in resources and strategy can effect. It does this by incorporating and balancing the firm's skill sets and attributes between surviving members, in the absence of stable resources. In consequence, repetition of the action cycle equips managers to learn from failures to operate with and without capabilities and so can dilute the fear of collapse that organisational crises invoke, a fear that so often leads to strategic and operational paralysis (Carmeli & Schaubroeck, 2008).

By articulating our U-model in Figure 2, we believe that the knowledge of this sequence provides a confidence building reference to improve timely decision making and to focus survivors on what they can do, given their parlous state, rather than waste energy and attention on matters they cannot change. A clear example of this is the focus the IPO gave the ActiveSky survivors prior to their third and most recent decline sequence. In earlier cycles, significant efforts were invested in appearing to look fully resourced, with a comprehensively capable operation. During the second round of creating new opportunities, the survivors openly acknowledged their limitations and, instead of pretending to be something they weren't, focussed on what they could do and outsourced to alliance partners the activities they couldn't do. We

don't pretend this is easy, but we do suggest that collapse can be survived with a pragmatic approach and a focus on key actions.

5.8 FROM SUB-LOOP TO META-LOOP: ESCAPING THE COLLAPSE TRAP

Collapse is a state that commonly generates some fear in managers. It evokes images of dispersal of all the firm's remaining assets, loss of staff and their unique cultural construction and a surrendering of the aspirations that the firm embodied. Yet we believe a distinct and defined set of actions can be instigated so to possibly navigate through collapse and then to escape from the energy-sapping loop of hopeful opportunity, failed options and involuntary lock in to a corrosive sequence. These actions arise when the firm operates below the level of operating stability, when strategy and resources are in flux as the buffeting impacts of adversity rock the firm, and are invoked to navigate through and to escape from a collapse trap.

5.9 CONCLUSION

We position these counter-intuitive actions for managers considering what is commonly the unthinkable; allowing collapse to proceed and conjecturing a future for the firm beyond it. While other literatures posit an array of lenses, this model focuses the key decision makers on very specific steps. These steps are invoked during the deliberate stages of capability dismantling, when temptations are strong to try to "recover" former resource configurations and routines, to orient surviving resources towards a possible opportunity creation phase later, should conditions allow. Then, even in the midst of a collapsed state, survivors can undertake very specific steps to form patterns of action in an unstable world, create new opportunities and, if such

opportunity persists, to rebuild reliable capabilities of the emergent firm. By knowing these steps in advance, we argue that the early stages of decline can be better managed with a clear eye to later rebuilding.

As we take this approach and apply it to other distressed firms facing irrevocable dissolution, we notice that, over time, the survivors behave differently with the resources they have. Patterns of activity allow for a possible time where certain assumptions of continuity or stability may not apply. Resource allocation decisions are made not only on strategic advantage in the short term, but resilience and support in adverse conditions in the mid term. Our belief is that such thinking makes for a more resilient organization; one that anticipates adversity but doesn't encourage it, that can cope with loss but doesn't succumb to it and that can rebuild again without assuming the strategic context of the past will remain unaltered.

In this way, our U-model is only one half of an ongoing cycle of a firm's existence; the half below the threshold of operating stability. An equally critical area for managers to study lies in deliberately building organizational resilience in times of strategic coherence and resource sufficiency, as exists above the threshold of operating stability. We argue that the learning of a resilience capability will enable organizational survival and growth in both good times and bad, that can exploit transient advantages (McGrath, 2013) for a long term benefit yet can also live without routine based capabilities should adverse conditions prevail and the very existence of their firm is at stake.

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CHAPTER 6 | DISCUSSION AND CONCLUSION

6.1 INTRODUCTION

This program of research began as a project to understand the trajectory of a firm experiencing multiple sequences of collapse and, in particular, what steps the firm could take to rebuild after a decline trajectory. In pursuing this understanding, how the firm managed to persist despite failure of strategy and loss of resources became a central issue for theory building. Consequently, the central thesis research question is: *How can firms build capabilities in resilience?*

This overarching question was broken down into component parts and has been expressed through Chapters 2, 3, 4 and 5, covering topics of the engaged scholarship method, dynamic capabilities, heuristics and organizational resilience. This closing chapter serves to integrate the insights from each of these earlier chapters to address the central research question.

A recapitulation of the major contributions of the earlier chapters is presented, then these insights are integrated to offer a specific and more general answer to the research question. In the first part, the theorising developed in the earlier chapters is extended to propose a resilience capabilities loop that utilises a changing heuristics pattern under both stable and unstable operating conditions. While building on the model developed in chapter 3, the extended model incorporates additional insights. The resilience capabilities loop model offers a specific answer to the central research question based on the data from our focal

case. This means that the model is restricted to addressing how firms can build a heuristics-based dynamic capability that renders it more resilient.

In a later section a more general model is developed going beyond just heuristics-based dynamic capabilities. Assembling the key variables into categories of antecedents, internal factors and outcomes led to this generalized theoretical model for firms building resilience capabilities. Following this analysis, I then elaborate on the contributions, theoretical implications, directions for future research as well as the practical implications before concluding the thesis.

6.2 RECAPITULATION OF EARLIER CHAPTERS

The four preceding chapters were each written as individual manuscripts, as outlined in the introduction chapter and summarised again in Table 1 below. The first of these provides an early introduction to the literature underpinning resilience and capabilities (Chapter 2). Then, the empirical case is presented (Chapter 3) that investigates the data, outlines the method adopted to undertake the case analysis and proposes heuristics-based capabilities as an alternative to routine-based capabilities under conditions of strategic and resource collapse.

The engaged scholarship method is then more deeply explored (Chapter 4) with regards to how it was applied and the learning derived for more general application. The findings in these earlier chapters are then presented for a practitioner audience (Chapter 5), to demonstrate how mastery of the decline-collapse-rebuilding sequence with its focal heuristics can enhance the resilience capability development within the firm. A brief review of each chapter follows.

Table 1: Research questions and contribution of the four central chapters.

Thesis Chapter	Research Question	Main Contributions
2	What are the conceptual foundations for a resilience-based approach to organizations?	A process model of organization resilience including antecedents, processes, orientations and outcomes
3	How can firms build dynamic capabilities to bounce back from collapse with new strategic impetus?	Theoretical model of how focal firm built heuristics-based dynamic capabilities for navigating and growing from collapse through purposeful capability dismantling during collapse and capability re-building post-collapse
4	How can academic and practitioner engagement encourage new real-time knowledge?	Advances rigour-real time-impact nexus to explore impact goals and gives an empirical example of engaged scholarship method to include real time assistance and research impact
5	How can organizations remain capable when their capabilities are gone?	Offers detailed practical guidance to practitioners experiencing collapse, including documenting the major phases of collapse and the adjustment of practical strategies as each phase is encountered

6.2.1 A Dynamic Capability View of Organizational Resilience

The thesis was not initially conceived as taking a resilience perspective. Rather, it emerged within the ‘Innovate’ phase of the delve-test-innovate-unlock cycle (explained in Chapter 4) underpinning the theory-building process. Resilience emerged as a way to conceptually embrace two oscillating tensions impacting the firm: a competitive advantage focus of capabilities when things are going well and resources are stable as opposed to a stability focus when the firm is in decline and resources are unstable.

Naturally, it became important to review the concept of resilience as used in the organization sciences because this construct addresses the notion of positive adaptation to adversity. It was the multi-disciplinary review of resilience that informed this notion and gave new understanding to how the construct could aid

management practice. The investigation sought to overcome the weakly-held assumptions of organizational decline and reaction to negative conditions that may limit theory-building and impact on practice. The review highlighted these assumptions and drew particularly on the work within the psychology domain around post-traumatic growth (Richardson, 2002) as an equivalent construct to positive adaptation to adversity for organizations (Martin & Sunley, 2015).

Heuristics appeared important in psychology research as an efficient mechanism for people to embed learning from adversity so as to be more resilient in the future (Gigerenzer, 2008). The review in Chapter 2 drew connections between heuristics and resilience research to more fully expound the links with dynamic capabilities (Bingham & Eisenhardt, 2011), allowing a more nuanced interpretation of the empirical data in the subsequent empirical chapter about learning (Bingham & Halebian, 2012).

Uncertainty confronts firms in high velocity markets, requiring distinctly different actions to successfully navigate as compared to moderately volatile markets (Davis, Eisenhardt, & Bingham, 2009). The role of heuristics in navigating such uncertainty is referenced in the context of selective information processing and decision making (Gigerenzer & Gaissmaier, 2011) towards improving performance (Eisenhardt, Furr, & Bingham, 2010) and enhancing strategy development (Bingham & Eisenhardt, 2011) but is not referenced in relation to contributing to resilience as a capability. The foundations for building an organizational resilience capability were developed in Chapter 2, deriving insights from the extended construct development across all the domains, with particular

emphasis on a process model derived from the psychology domain (Luthar, 2006; Masten, 2007, 2014; Richardson, 2002).

Exploring underlying assumptions generated a range of questions that need to be answered when applying the construct to management sciences. If resilience is assumed to be a trait (of an individual or a firm), then the means for developing those traits needs to be explicit (cp. Lissack & Letiche, 2002). If resilience is assumed to be a process of learning protective actions to guard against perceived vulnerabilities (as commonly modelled for engineering resilience, as in Hale & Heijer, 2006) then the process for building resilience over time also needs to be made explicit for firms (Masten, 2001). Also for organizational settings, the assumptions underpinning resilience as a global phenomena applied across any array of adversities, as compared to a specific phenomena learnt and applied to distinct configurations of threats and requiring distinct configurations of responsive action, need clear articulation (Masten & Obradović, 2008).

The model presented as Figure 1 in Chapter 2 is based on process research into psychological resilience (Richardson, 2002). It exposes how resilience works in response to threats and disorganizations over time leading to a range of outcomes. The process model begins, firstly, with an assessment of the threat posed by adverse conditions. It offers the key threat dimensions as severity, complexity, catalysts for propagation of the threat, frequency of occurrence and familiarity of the threat elements with survivors in the firm. By their nature these threats represent an uncertain outcome for the firm, so will demand some immediate response from key decision makers (or survivors if the firm has already

experienced a decline) to harness resources and dynamic capabilities so as to refute the threat or integrate its dimensions into a more capable operation.

Secondly, the firm assesses the likely impact of such threats given the protections it has in place and the stability or otherwise of its strategy, resources and routines. The key consideration proposed here is way the threat generates disorganization and three are indicated. Strategic disorganization means the threat challenges the way the firm is seeking to make money, perhaps even the underlying business model. Operating disorganization challenges the activities being used by the firm to realise its strategy and resource disorganization challenges the assets the firm controls, or has access to, in order to enact the routines of action. Each type of organization requires a different response from the firm.

Thirdly, the way the firm is able to respond to the threats and resulting disorganization(s) is a function of its mastery of routines (and their agile adjustment) and the repertoire of heuristics (and the context in which they are best applied) when routines cannot be maintained. This division of routine-based and heuristic-based responses to disruption differentiates organizational resilience from personal resilience as it is articulated in the literatures to date.

Finally, the range of outcomes that can result allow not only for recovery to a former level of performance, but to actually exceeding this former level, to a state labelled as resilient reintegration (Richardson, 2002) or adaptability (Limnios, Mazzarol, Ghadouani, & Schilizzi, 2014). This possibility of post-traumatic gain (Masten, 2014; Zoellner & Maercker, 2006) supports the notion that a firm can

build stronger, more robust capabilities as a direct consequence of navigating adverse conditions. Thriving through adversity by resilience and agility (Lengnick-Hall & Beck, 2009) becomes a real option offered by this process model.

As mentioned above, this process differentiates between routine based capabilities, where reliably repeated actions yield efficiency but under adverse conditions can lack flexibility, and heuristics, where simple rules ignore swathes of information in favour of conserving cognitive and operating resources for the key performance requirement of surviving the disruption. While routines are a well established feature of the capabilities based view (Felin, Foss, Heimeriks, & Madsen, 2012; Winter, 2013), heuristics and their impact on capabilities when navigating uncertainty are a less common research area (with Bingham & Halebian, 2012; Mousavi & Gigerenzer, 2014 being an exception).

For organizational settings, resilience is presented as a process of capability building than as a trait requiring innate orientations, meaning it can be acquired (Taleb, 2012). Firms face different types and configurations of threats and disorganizations, requiring a dynamic capability that adjusts resilient responses to these varying configurations. The orientation a firm's key decision makers have towards resilience (eg. return to homeostasis versus growth) also profoundly affects the achievable outcomes. Chapter 2 set out to address the question: *what are the conceptual foundations for a resilience-based approach to organizations?* The key contribution of the review is greater abstraction of the theoretical variables and assumptions that underpin resilience as a capability that can be learned by firms and applied under adverse conditions.

6.2.2 Heuristics to Survive Firm Collapse

Chapter 3 posits the question: *What capabilities are required to survive firm collapse?* Drawing on 14 years of empirical data this process research applied an engaged scholarship methodology in accessing interviews, diaries, notes, files and emails from 24 informants, to build an interpretive schema of how the focal firm navigated three successive cycles of capability decline, collapse and rebuilding. Each of these cycles were addressed as a distinct sequence so providing an embedded case design within the engaged scholarship framework. A key component of this approach lay in the exchanges between informant practitioners and academics to interpret the deep privileged access to the firm's data, with myself as the lead researcher providing an insider perspective.

The findings informed the process of decline, by proposing a distinct capability dismantling activity during decline with a view to surviving collapse and later an opportunity forming activity set to rebuild the firm. Decline is usually represented as a sustained sequence of substantially decreasing resources (Cameron, Kim, & Whetten, 1987) and implying that a firm has, at best, a single shot at turning around the decline to transition to a new, sustaining strategic initiative to avoid failure and extinction (Sheppard & Chowdhury, 2005).

The model presented in Chapter 3 instead proposes a conceptualisation of decline as recoverable through iterative attempts at survive with a small, unstable or initially intangible resource base and to rebuild a firm by attracting new resources (or recognising previously overlooked resources) around one or more uniquely formed opportunities. By including iterative cycles around a pattern of

boundary transitions, the model expands beyond an emphasis on a single shot strategic attempt and provides for many attempts to survive environmental turbulence, strategic uncertainty and resource collapse. This model not only recognises the value of using existing resources in new ways towards an organizational recovery (Morrow, Sirmon, Hitt, & Holcomb, 2007) but also embraces the iterative actions of attracting new resources to form and enable key strategic opportunities (Alvarez & Barney, 2007; Barreto, 2012; Denrell, Fang, & Winter, 2003) to avoid decision incongruence (Mitchell & Shepherd, 2012).

These iterative actions are embedded as dynamic capabilities within an anatomy of decline, collapse and rebuilding incorporating four key boundary transitions. Whereas commonly such changes of state under difficult conditions are considered through a single lens, such as strategy (Hodgkinson & Wright, 2002) or resources (De Carolis, Yang, Deeds, & Nelling, 2009) or occasionally both (Agarwal, Barney, Foss, & Klein, 2009), here I adopt three key lenses of strategy, resources and communications. That is, strategy, resources and communications emerged in the course of managing collapse as key sites for locating the use of heuristics.

Adopting a heuristics based dynamic capabilities orientation underpins the rebuilding process. Such rebuilding draws on both strategic and resource attraction attributes of the firm, rather than just a strategic renewal process through scenario planning and cognitive mapping (Hodgkinson & Wright, 2002). One of the key findings was that future resilience of the firm lay in surviving the

adverse conditions of the present and that such survival required adaptive rules that could be applied when strategy was failing and resources becoming unstable.

This is shown in Figure 2 of Chapter 3, being the model developed to describe the decline-collapse-rebuilding sequence and to detail the heuristics based transitions for each phase. This model presented four boundary transitions occurring during the period where the firm operates below the threshold of operating stability. The focus of the firm under these conditions requires the more difficult task of leveraging temporary advantages to regain stability (Sirmon, Hitt, Arregle, & Campbell, 2010), as compared to a focus on sustained competitive advantage that commonly apply under conditions of strategic cohesion and resource sufficiency (D'Aveni, Dagnino, & Smith, 2010; McGrath, 2013).

From the data gathered, the first boundary transition occurs when the firm begins to experience operating instability, as resource gaps emerge causing breaks in routine execution and thereby begins the process of capability decline. This transition proscribed a strategy focus on stripping away high resource consuming assets in favour of retaining a low resource-consuming base, in anticipation of a future collapse of resources. Maintaining the low resource consuming assets increase the chances of the firm surviving the period of collapse by drawing on unstable or intermittent and opportunistic resource access. This transition also suggests a communication format that includes stakeholders (being members of the firm as well as engaged stakeholders and advisors) in a pragmatic appraisal of looming constraints and likely rebuilding timeframes.

The second boundary transition occurs as the firm enters a collapsed state, where all but the lowest resource consuming assets (such as legacy reputation, key stakeholder commitment and partner alliances) can remain sufficiently intact to allow the possibility of rebuilding at some future time. At this transition, the focus lies in iteratively forming new opportunities through combinations of resource access options, which can only be advanced if that particular strategy formation proceeds. In other words, absent control of resources, the firm must rely on its relationship forming and strategy development skills, so that opportunity development meets the needs of that particular arrangement of partners and resources. The activity sequences are necessarily ad hoc and opportunistic, since no stable routines can be maintained without stable resources and a secure strategic focus. Communications rely in articulating future operating actions to partners, particularly those that act as gatekeepers to essential resources to secure opportunity formation of that specific strategy.

The third boundary transition occurs as a strategic focus forms sufficiently to allow resources and resource access to establish in a favourable pattern to secure strategic formation and increasingly stable activity sets. Surviving firm members learn new actions to derive immediate value from the resources they currently access in the knowledge that should this rebuilding trajectory continue, entirely new routines of action may later be required as resource control becomes stable. This stage represents one of adaptation and operating agility since the future benefits of the chosen strategic formation remains uncertain and resources can still be unstable.

The fourth and final boundary transition described in the model prepares the firm for a return to operating stability, where resources are reliably secure, actions sufficiently robust to become routine and coherent strategy allows the firm to again focus on competitive advantage rather than the survival focus of earlier phases. It is this transition where a number of consequences are presented, yielding either a return to a former state of homeostasis without further growth, a new collapse sequence, the construction of new operating capabilities compared to those that existed prior to the initial decline or even an entirely new strategic direction addressing different markets. Each of these options reflect differing realisations of a resilience capability.

The central binding ability for traversing these phases is learning by the survivors from current conditions and their adapting to new conditions that form as new opportunities emerge. This model addresses how dynamic capabilities are built to bounce back from collapse, by defining a sequence of heuristics operating within an anatomy of capabilities to iteratively rebuild from newly formed opportunities. One of these capabilities is organisational resilience, on the assumptions that adverse conditions will continue to impact upon the firm and that it will remain vulnerable to such adversities unless it learns new actions, adapts to changing resource access configurations and iteratively forms new opportunities with very few resources.

The chapter contributes to a number of literatures. Firstly, it seeks to deepen the understanding of dynamic capabilities by disconnecting repeated routines of action from the ability of the firm to reconfigure its resource base and the

activities that make use of these resources (Helfat et al., 2007; Winter, 2003). In doing so, it casts dynamic capabilities as engines of regeneration (Ambrosini, Bowman, & Collier, 2009) through perceiving possible, not currently extant, resource combinations that may lead to an advantage whether transient or sustained and so forming new opportunities through these new combinations. The focus here lies in survival under conditions of collapse rather than firm performance in high velocity environments (Drnevich & Kriauciunas, 2011).

Secondly, it contributes to literature on heuristics by giving a clear context and framework to the rules that can apply through a collapse episode. Heuristics are explored in both management sciences (Bingham & Eisenhardt, 2011) and cognitive psychology (Gigerenzer & Brighton, 2009), mirroring the similar combination of domains explored in Chapter 2 with regards to resilience.

Thirdly, it advances turnaround literature beyond a series of value creating strategic renewal attempts, that seek to recombine existing resources yet predict extinction should those recovery attempts prove unsuccessful (Morrow et al., 2007). It offers an iterative process of a continuing opportunity formation effort that involves not only attracting access to new resources but also partner alliances to regain operating stability despite an unstable resource base.

6.2.3 Engaged Scholarship with Impact

Chapter 4 outlined the engaged scholarship methodology at the heart of the thesis research, providing detail regarding how the methodology was employed to collect and analyse data and inform theory-building. This chapter aims to contribute to engaged scholarship research method literature by detailing two

additional tools to help researchers achieve aims of rigor, real time assistance and impact. It highlights the belief that these methods deserve an increased role in management research.

This chapter describes a real life example of engaged scholarship in action, whereby academic researchers collaborated with practitioners to solve problems in real time, build new theory that may assist other firms and, in the process build new skills that enhanced the firm's own organisational resilience to withstanding future shocks. Here academics in the research team had to become intimately acquainted with making practical decisions, while practitioners learnt skills in theory-building. In particular, the chapter describes how the iterative process of problem formulation, theory building, research design and problem solving led to increasingly more complex models tested against their value in real time to decision makers in the focal case. The empirical case targets the rigor-relevance debate, explored through a research question asking how academic and practitioner engagement can encourage new real-time knowledge.

The particular phenomena of note was the inclusion of myself as an active insider, straddling roles as both a key decision making practitioner within the focal firm, enacting strategy and capability dismantling or rebuilding through the decline-collapse-rebuilding trajectory, as well as knowledge producing researcher, learning new skills derived from insights gained within the focal firm.

In terms of real time assistance, Chapter 4 outlines how reflection on theory-building progressed throughout the thesis. Several early theory-building models were shared culminating in the main theoretical model presented in Chapter 3.

Reflection identified four phases and 15 steps involved in theory-building. The four phases are: 1) delve – deep immersion in the data, 2) test – review of emerging model by external academics and testing of real time impact with practitioners, 3) innovate – step outside the box of current model building and experiment with innovative lenses and 4) once a lens is selected then explore it deeply to unlock theoretical value. The delve-test-innovate-unlock cycle sits within Van de Ven's (2007) four stages of engaged scholarship (problem formulation, theory-building, research design and problem solving) but reveal more of the theory-building micro-dynamic that propagates the four stages.

The original interpretation of the events confronting the focal firm proposed a single period of decline and perturbations of capabilities as the firm wrestled with strategic and resource collapse. This conceptualisation conforms with extant turnaround literatures (Chowdhury, 2002; Weitzel & Jonsson, 1989). Adaptation of the engaged scholarship iterative actions developed that original interpretation into the three embedded cases presented in the timeline figure, as the 15 steps became a repeated sequence. This development demonstrates how learning occurred not just for heuristics to master new rules for navigating collapse, but also for the method itself, to distil new actions in how the engagement could add value to the firm and build new theory.

The key contribution is how engagement can encourage real time assistance to benefit decision making under ambiguous and adverse conditions while also building theory that potentially benefits a wider distribution of firms. Such real time assistance is a generally overlooked benefit missing from much of the rigour-

relevance debate (eg. Aguinis, Shapiro, Antonacopoulou, & Cummings, 2014). The role of such real time benefits as a proxy for impact was explored using an iterative sequence labelled as delve-test-innovate-unlock.

Impact is defined as the long term or indirect effect on stakeholders of the outcomes resulting from the chosen action (Penna & Phillips, 2005). In current research impact is judged in terms of academic citations and is often left vague in terms of practitioner outcomes. Chapter 4 linked research impact with conversations in social entrepreneurship and the non-profit sector concerning how to measure impact (Penna & Phillips, 2005). The BACKS model (behaviour, attitude, conditions, knowledge and status) was presented as one option for how impact can be measured in the research process. By expanding the engaged scholarship framework with additional tools, I hope this review of the adopted method can positively contribute to the rigor versus relevance debate (Hodgkinson & Rousseau, 2009; Kieser & Leiner, 2009).

6.2.4 Remaining Capable without Capabilities

Chapter 5 set out to interpret the empirical findings resulting from the extensive longitudinal data collection and address them to managers in the field. The aim is to offer guidance for the development of resilience capabilities in response to threats of, and navigation through, strategic and resource collapse. This chapter demonstrates how conceptual findings drawn from empirical data can be translated to a practitioner audience.

In doing so, the chapter highlights a particular pathology, the collapse trap, that can affect firms facing conditions of strategic failure and resource dissipation.

The collapse trap describes actions that are aimed to recover from decline but that in fact extend collapse, propagated by naïve assumptions about collapse and recovery that drive mistaken actions. These flawed assumptions include a focus on resource recovery when strategic objectives do not meet expectations, as well as a focus on existing resources that are unable to deliver new strategic outcomes with new routines of action. Whereas strategic failure and dissipating resources are commonly regarded as leading to firm cessation, this assumption may not necessarily need to be entirely true. This chapter posits that firms can learn to survive (even if barely) and be sufficiently capable at navigating strategic and resource collapse, so providing an opportunity to escape the collapse trap.

Capabilities are defined in terms of exploitation of resources by robust routine actions, with repeatable routines that reliably deliver positive outcomes being regarded as capabilities. Consequently when resource gaps appear routine actions become less robust and less reliable. Under conditions of resource collapse, routines disappear altogether to be replaced with ad hoc actions requiring more intense cognition on the part of managers and less reliability and repetition in delivering positive outcomes.

The research question underpinning this paper addresses how the firm can still be capable in delivering or developing value without reliable capabilities. In addressing this condition to a practitioner audience, it is focussed on real actions managers can take to facilitate active capability dismantling during the decline phase of the trajectory ready for an indeterminate period of collapse. During this period of collapse, a focus on agile adaptation, learning and opportunity formation

allows a more developed model of regaining capabilities than current turnaround models. Flawed assumptions underscore subsequent flawed actions, more likely to lead to a failure to recover from a collapsed state, remaining caught in the collapse trap.

The chapter adds richness to the anatomy of collapse and the varying paths firms may take as they navigate through adverse conditions. The focus on managerial cognitions in the form of flawed assumptions leads to the identification of key cognitions and actions, underpinning how firms can (and can not) build capabilities in resilience.

6.3 INTEGRATIVE ANSWER TO THESIS RESEARCH QUESTION

In this section, the collective insights are integrated to address the central thesis research question in two parts. In the first part, an integrated model for how firms can build a specific type of resilience capability - a heuristics-based dynamic capability - is presented. This model draws on and expands the data gathered in investigating three sequences of collapse and the analysis undertaken to derive specific heuristics adopted by the focal firm.

In the second part, this data is abstracted to distil the key variables at play affecting how firms can build resilience capabilities. This second section moves away from the specifics of the sort of resilience capability, which has been the focus of the thesis research, to abstract more general principles governing how firms build resilience capabilities.

6.3.1 Part 1: Heuristics-based Dynamic Resilience Capability

The study of ActiveSky began as a process to understand why a firm with such radical technology operating under such promising initial conditions should flounder and collapse on multiple occasions. What began as a study assessing decisions and decision processes at strategic and operating levels became a study of resilience and adaptive cycles as waves of adversities impacted upon the firm.

This study shows how rational heuristics learning resulted from process experience. That is, that firms first learn simple rules for selection of resources and the procedures by which they can be utilised and then, with more experience, learn the timing and priorities to be applied to such sequencing (Bingham & Eisenhardt, 2011). As an initial approach, the strategists at ActiveSky were oriented towards validating the significance of their technology and gaining peer group acceptance and so selected partner relationships and processes towards this goal.

After experiencing collapse they learned that the most pressing need was to establish positive cash flows and that business model architecture and details of capability development, whether gained in house or accessed via partner alliances, needed priority consideration and embedding over resource utilisation activities. They built resource inertia too quickly, when in fact they should have maintained high flexibility (Eisenhardt et al., 2010; Gilbert, 2005). In hindsight, an initial focus on the timing and priority of the opportunities they navigated may have drawn early consideration of the required capabilities to enact their strategic goals. Then, they could have focussed on resource selections and operating procedures, evolving these into robust routines to enact such strategic goals.

Across a range of research domains, evidence is given that resilience capabilities can be built in a variety of ways, but simple rules that enable quick decisions in uncertain conditions are central. Accordingly, theory building drew focus on heuristic based dynamic capabilities as the central feature of a resilient firm, particularly under conditions of strategic and resource collapse. This draws on earlier research covering strategic and resource collapse (McGrath, 1999; Mellahi & Wilkinson, 2004; Probst & Raisch, 2005; Sheppard & Chowdhury, 2005) as well as extensive literatures covering firms under conditions of strategic and resource cohesion (Ensley, Pearson, & Amason, 2002; Raynor, 2007; Rumelt, 2011) to model how a heuristics based resilience capability would function across a range of operating conditions (Bingham & Eisenhardt, 2011). The three heuristic clusters of strategy, resources and communications, derived from the data gathered, were used to describe what rules are used as a firm navigates sequences of decline, collapse, rebuilding and performance through various boundary transitions.

The progression of heuristics, skills, benefits and traps at each of the boundary transitions, including the four transitions outlined above, is given in Table 2 below to show how dynamic capabilities vary in their construction depending on the stage the firm is navigating along with the heuristics that are applied. This analysis gives a greater insight into the nuances of dynamic capabilities, beyond an amorphous hierarchical mass into a context-specific, heuristics-based, multi-faceted phenomenon requiring continual cognitive analyses and selection activities. This representation of dynamic capabilities differs from the portrayal of

higher order and lower order dynamic capabilities and other such multilayered divisions (Danneels, 2012; Hine, Parker, Pregelj, & Verreynne, 2014; Schreyögg & Kliesch-Eberl, 2007) that seek to model how dynamic capabilities themselves test for context and sense and apply new routines of change and transformation.

This conceptualization suggests that phases of decline and rebuilding can be split into two distinct paths, each requiring distinct sets of heuristics and resilience capabilities. These distinct paths are separated by a notional threshold of operating stability, above which the firm can rely on access to resources, even if these may be shrinking or growing, and below which such resource access is unstable or not available. The case data and modelling indicate that different capabilities and rules are required to describe the transitional arc depending on the strategic cohesion and resources available to the firm, independent of the perceived environmental velocity.

This notion of a progressive arc contrasts with the view from turnaround literature that commonly portrays decline as a contiguous sequence of progressive loss of capability and resources to be reversed by a single strategic shift or choice. Should the strategic shift prove successful and the firm can begin to recover, such capability rebuilding is commonly portrayed as a contiguous process of strategy application, resource accumulation and capability growth without any reference to the changing foci and dynamic boundary conditions that emerge for each progressive step.

This approach also impacts the inter-relationships of various types of organizational capabilities if these are regarded as a hierarchical system. In such a

hierarchy, resources act as the zero order competency, requiring actions to be taken between them to create value (Gruber, Heinemann, Brettel, & Hungeling, 2010) while such resources provide a buffer when the firm navigates adverse conditions (De Carolis et al., 2009). Operating capabilities extract value from such resources through repeated activity sets, or routines, as a first order competency (Pentland, Feldman, Becker, & Liu, 2012). Dynamic capabilities serve to reconfigure these operating routines and resource combinations to adapt to changing conditions as a second order competency (Danneels, 2012) that enables change, renewal and regeneration of the resource base and attendant routines (Ambrosini et al., 2009). These hierarchical inter-relationships therefore must founder of the resource foundation, along with the routines used to extract value, collapse or become unstable. If the lifecycle of such relationships are regarded as a simple linear progression through capability accumulation, reconfiguration or disposal, all assuming an underlying resource sufficiency (Helfat & Peteraf, 2003), then the capability hierarchy meets a boundary condition during the adverse conditions experienced by the focal firm of this study.

The data from this focal firm shows a need for more than just a change in strategy for turn around of decline to be successful (as in Chowdhury, 2002). The study shows that firms can survive strategic failure and unstable resources if capabilities are built on heuristics rather than routines. For heuristic based capabilities to be shown as distinct from routine based capabilities yet potentially co-existing, I need to demonstrate how dynamic capabilities are applied with changes in strategic cohesion and resource sufficiency, augmenting the already

developed view of dynamic capabilities changing with environmental velocity (Eisenhardt & Martin, 2000). I argue that conditions of strategic and resource collapse represent a distinct space, focussed on survival and regaining stability, compared to conditions of strategic cohesion and resource sufficiency, focussed on sustained competitive advantage. In this context, a resilience capability can be learned, to support a firm under both sets of conditions regardless of the speed of change outside the firm. Next, I will expand from the data to propose a resilience capability loop that draws on heuristic based dynamic capabilities and how sustained resilience requires management of both heuristics and routines.

The Resilience Capability Loop

Heuristic based capabilities have been charted in chapter 3, under conditions of strategic and resource collapse where the firm focus lies in survival. Firm performance under conditions of strategic cohesion and resource sufficiency, where the firm can focus on sustaining competitive advantage, are well charted (eg. Newbert, 2008). Accordingly, the resilience capability loop is an expansion of the model introduced in chapter 3, to yield six sectors shown in Table 2 embrace both adverse and advantage orientations of cyclic yet ongoing performance and growth to underpin a resilience capability. Figure 1 depicts the sectors and boundary transitions as these apply above or below the threshold of operating stability. They indicate how the focus of dynamic capabilities progress for a firm under different strategic, operating and resource conditions and the transitions required to enable such progression. The sectors are defined in terms of dynamic capabilities and heuristics in Table 3 below.

Table 2: How heuristics, skills, benefits & traps vary through each of the 6 transitions for the resilience capabilities loop

Boundary Transition	Heuristics	Skills	Benefits	Traps
1	<p>Strategy: change from recovery goal to retain low resource-consuming assets</p> <p>Resources: strip high resource-consuming assets & suppress structure</p> <p>Communications: warn of impending restrictions & consequences</p>	Strategic agility to detect instability onset & change from recovery focus to dismantling focus	Early release of resource hungry assets & routines of action	Lose stability & momentum if recovery condition ensues, despite earlier assessment, key resource mix needs rebuilding. Also, dismantling hard to control, so resources (such as staff) can exit firm and accelerate instability
2	<p>Strategy: Reiteratively form new insights for potential partners with resource options</p> <p>Resources: devise ad hoc activity sequences from individual skills available</p> <p>Communications: share strategic options & configurations with survivors & advisors</p>	Business model design to shape options with resources required and access to such resources, while striving for a stability focus	Practice strategic option forming with resource targeting & access – benefit carries forward to rebuilding phase if this arises	Survivors lose belief in the firm being capable to enact identified strategic options & resource access and exit, cementing collapse state
3	<p>Strategy: Assemble resources around new opportunities iteratively developed</p> <p>Resources: learn new activity patterns suiting resources</p> <p>Communications: test strategy & action sequences</p>	Identify range of operating conditions required for each resource bundle & steps to dismantle if opportunity falters	Assemble agile resources suiting strategy with clear exit process for each resource	Firm unable to gain traction with any new opportunity due to resource access restrictions or low survivor commitment
4	<p>Strategy: secure control of resources for emerging opportunity of greatest fit</p> <p>Resources: configure activity patterns & build structure</p> <p>Communications: reinforce strategy & action patterns</p>	Consolidate new collective activities to deliver desired results as robust, routine actions	Re-enter condition operating stability with reliable results from routine actions	Activities do not translate to collective knowledge & skill sharing, undermining stability & performance

5	<p>Strategy: tune configuration of resources & activities for consolidated opportunity</p> <p>Resources: routines of action drive resource configuration for repeatable performance</p> <p>Communications: reinforce strategic fit with resources & activities adopted; highlight remedies for any identified misfits</p>	<p>Reconfiguring & attracting new resources & activity patterns to maintain performance advantages. Reviewing for strategic fit, seeking exceptions & anomalies for remedy with new resource development or acquisition</p>	<p>Practiced adaptation to setbacks by adjusting resource mix & activities to continue competitive advantages builds resilience responses</p>	<p>Strategic, resource or routine rigidities can block cognition of potentially destabilizing conditions preventing maintenance of operating stability</p>
6	<p>Strategy: balance efficiency & flexibility in reconfiguring resources & activities for established opportunities</p> <p>Resources: seek improved resource matrix with renewed activities to recover performance premium</p> <p>Communications: articulate heuristics used to balance efficiency & flexibility</p>	<p>Key balancing heuristics for structure environment & cognition to maintain stability as strategic & resource fluctuations or decline, while maintaining a competitive advantage focus as gaps in routine performance emerge</p>	<p>Early stages of any decline maintain competitive advantages, mindful of key performance thresholds that may invoke operating instability and strategic or operating uncertainty & complexity. Deepens resilience responses & adaptations</p>	<p>Adaptation insufficient while strategy intact & resources sufficient, invoking loss of operating stability and deeply restricted strategic & resource options</p>

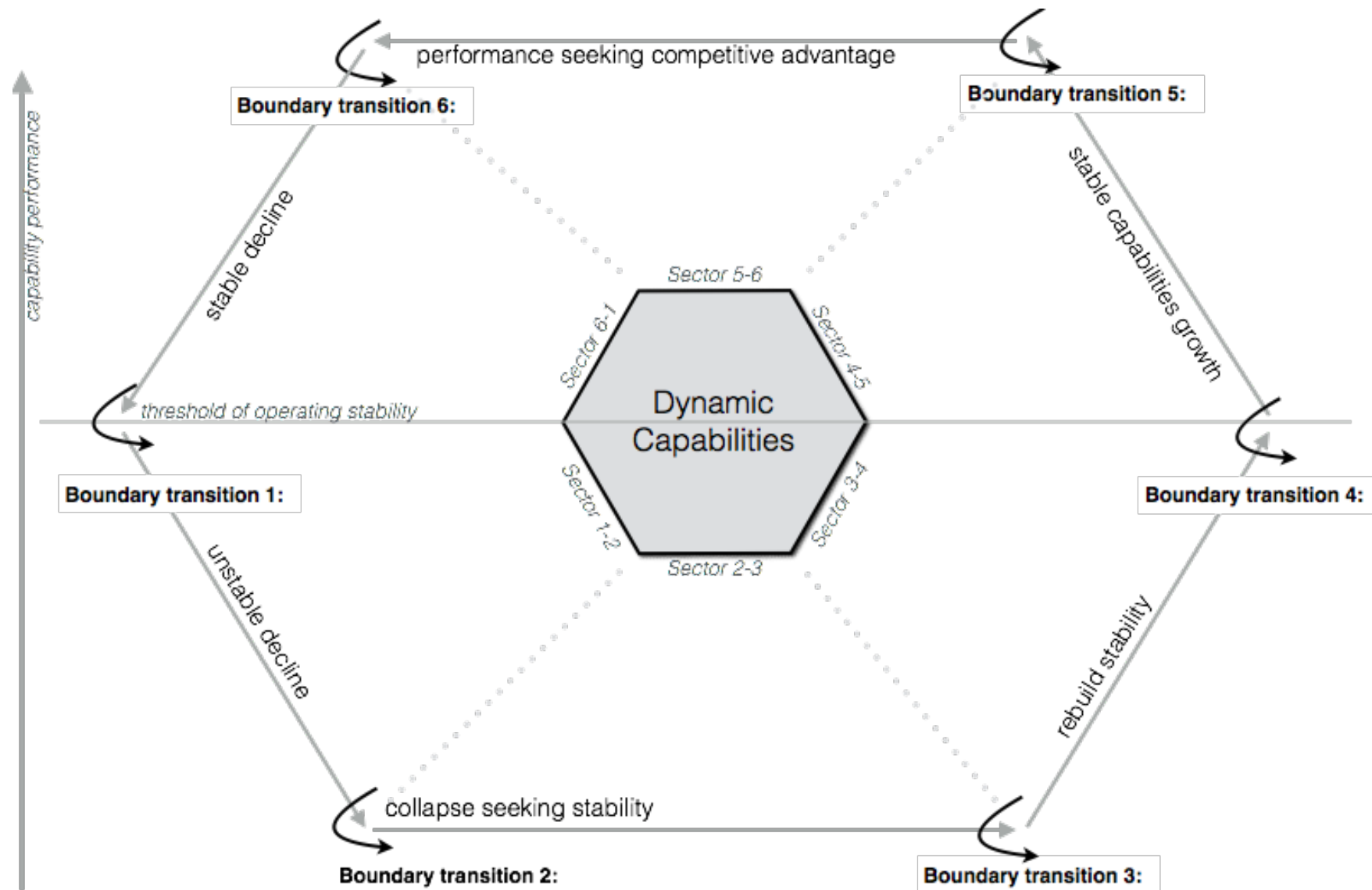


Figure 1: The performance loop of resilience capabilities showing a six stage progression of boundary transitions.

Table 3: Using heuristics to enact dynamic capabilities across sectors of the resilience capability loop, as derived from case data and extant literature.

Sector	Dynamic Capabilities	Key Heuristics
1-2 Unstable decline, without operating stability	Seek diversity of commitment (eg through ad hoc alliances) to aid later rebuilding of strategy & resources (Brock, Mäler, & Perrings, 2002)	a) concentrate strategic control to central group of survivors; b) identify & strip high consumption resources
2-3 Collapsed state seeking stability	Requires sufficient survivor commitment to pursue formation of new options & business models and then negotiating resource access to enable value growth (Walker & Salt, 2012)	a) reiteratively shape & form new opportunities, identifying base resources needing access to realise growth
3-4 Rebuilding activities towards operating stability	Specific processes to attract, access & configure a changing resource base using heuristics (as for high velocity conditions) yielding unpredictable outcomes (Eisenhardt & Martin, 2000; Peteraf, Di Stefano, & Verona, 2013)	a) allocate resource access based on attractive returns from forming options & cultural fit between resource holders
4-5 Capabilities growth towards competitive advantages	Routine based capabilities form through iterations of productive activity sets developed from ad hoc problem solving into proven repeated performance (Becker, 2004; Winter, 2003, 2012)	a) adaptive balance of exploration & exploitation in self-organizing business units as capabilities grow (Limnios et al., 2014)
5-6 Sustained performance seeking to extend competitive advantage	Integrate & build resource & activity configurations through sensing, seizing & transforming new opportunities with routine actions to sustain high performance (Teece, Pisano, & Shuen, 1997)	a) maintain high performance by balancing efficiency with flexibility (Eisenhardt, Furr & Bingham, 2010) b) practice iteratively reconfiguring resources & associated activity routines by leveraging asymmetries (Miller, 2003)
6-1 Stable decline with operating stability	Iterate responses & positive transitions using turnaround orientation to recover full advantages (Chowdhury, 2002; Woods, 2006)	a) reconfigure existing resources to gain new strategic growth options (Morrow et al., 2007) b) deepen resource cognition & their scope of possible uses (Danneels, 2010)

Sector 1-2 is initiated when the firm discerns a change from stability to instability, a division that distinguishes this model from other decline and turnaround models. The insight here is that the strategic choices and opportunity types that can be generated are different for a firm navigating decline in the context of strategic change and resource sufficiency (a state above the threshold of operating stability) and a firm navigating such decline but in a context of strategic and resource collapse (a state below the threshold of operating stability). The data indicates that a concentration of strategic control, to quickly and cohesively form and take up fragile opportunities for development into new options, along with stripping high resource consuming attributes (such as expensive office space, financially needy staff or high maintenance partner arrangements) underpin the rules needed during the passage of this sector. This resource stripping action contradicts common responses to crises that invoke sustainability goals through the higher costs of increasing complexity and concentrated control (eg. Tainter & Taylor, 2014).

Sector 2-3 represents a deeply unstable sequence to navigate without any certainty that the firm will survive. Strategic and resource collapse in many ways is living in the midst of chaos rather than on the edge of it (see Brown & Eisenhardt, 1998; Burgelman & Grove, 2007). The proposal here is the firm needs to constantly and iteratively shape and form new opportunities, despite its lack of resources it controls or can access, with a view to identifying their own unique skills. These identified advantages allow an opportunity to emerge that otherwise could not exist. I do not claim this opportunity formation is an easy activity to pursue but the data supports the emergence of new opportunities even when no coherent

strategy is in place and resources have largely dissipated. The assumed condition is that committed survivors adopt an asymmetric view of advantage (Miller, 2003) so to adaptively grasp how their skills, experience and insights add value to arising options, can adapt to a range of business models that allow them to rebuild the firm's capabilities while adding value to their customers. Crucially, this sector of the model requires the survivors to identify and attract the necessary resources and activity sets to enact such value creation.

Sector 3-4 is a time of rebuilding through developing those opportunities that gain strategic and resource traction. That is, the upside is attractive to the survivors of a firm seeking to exit collapse and these survivors are able to attract the necessary resources, possibly through alliance partners, and learn new activity sequences to rebuild the organization. These actions have been characterised as ad hoc problem solving (Winter, 2013), bricolage (Baker & Nelson, 2005), rational heuristics (Bingham & Eisenhardt, 2011), entrepreneurial action (Teece, 2012) and dynamic capabilities in high velocity environments (Eisenhardt & Martin, 2000). While aspects of all of these labels are relevant, I frame this rebuilding period from collapse primarily as a time of strategic and activity pattern learning, opportunity formation and testing, along with resource and alliance attraction. These sequences are iterative and interdependent, meaning that if traction on a particular opportunity cannot be gained, the firm reverts to the previous unstable sector 2-3. In sector 3-4, the firm still cannot establish operating routine based capabilities since resources remain only transiently stable, its access to such resources volatile and its patterns of action not reliably delivering desired outcomes. Taken together, they indicate that new capabilities are heuristics based.

If the opportunity remains sufficiently attractive and continues to deliver desired returns, routine actions may begin to supplant heuristic actions to consolidate stability (cp. Winter, 2012).

Sector 4-5 enters the familiar territory of cohesive strategy, stable resources, patterned activities forming reliable routines of operating action that emerge as operating capabilities and a shift in focus from survival towards operating stability. Whether the firm remains in a market exhibiting conditions of high velocity change, moderate velocity change or a stable operating environment, the firm operates in this space with relative security regarding its resources, its strategy and its capacity to reconfigure, renew and organise towards gaining peak performance (Abell, Felin, & Foss, 2008; Teece, 2014). In this sector, efficiency is encouraged with routine base capabilities while flexibility to adapt to changing conditions is derived from heuristics based capabilities (Eisenhardt et al., 2010)

Sector 5-6 again represents familiar territory of established successful resource configuration, high performing routines and reliable operations were the key issue to be addressed is overcoming the negative impacts of inertia through an iterative process of rebalancing routine based efficiency and heuristic based flexibility (Eisenhardt et al., 2010).

Sector 6-1 represents the early stage of decline, when resources still exist and strategy is faltering but is not yet incoherent. The transition to entering such decline indicates gaps in the dynamic capabilities that sense changes in endogenous capacity or exogenous conditions, seize emerging opportunities and transform existing resource configurations and routine actions to build from such

opportunities (Teece, 2007). I argue that the process of navigating sequences of capability decline can be positive for the firm, providing they are able to extract new learning and apply this knowledge to improving skills, renewing routines or introducing heuristic actions to less stable resources. Constructs such as resource cognition (Danneels, 2010), routine and resource rigidity (Gilbert, 2005), strategic turnaround (Lohrke, Bedeian, & Palmer, 2004) and capability dynamization (Schreyögg & Kliesch-Eberl, 2007) have well covered this terrain, using underlying assumptions of resource sufficiency and strategic cohesion between actors (usually top management teams).

In support of my argument, I regard any actions above the threshold of operating stability (according to my model as Figure 1) as a productive space to try new ideas and cope with strategic and resource fluctuations with either routine or heuristic actions. Combining these differing action types builds resilience capabilities through practice of both routines and heuristics. Should deeply adverse conditions strike and their operations become unstable, they have then practised the iterations of strategy, resourcing and communication heuristics to quickly and competently adjust towards regaining operating stability.

The progression through these six sectors in terms of dynamic capabilities and focal heuristics are summarised in Table 3, consolidating the descriptions above and supplementing the outline of six boundary transitions and their associated heuristic orientations as represented in Figure 1.

6.3.2 Part 2: General Principles

The overall thesis research question is: *How can firms build capabilities in resilience?* In the preceding section, the individual contributions of earlier chapters were integrated to respond to the central thesis research question through heuristics-based dynamic capabilities. This specific case arises based on the presentation of specific configurations of threats and disorganizations experienced by the firm. However, the accumulated understanding also permits identification of more general principles that may apply in answering the central thesis research question.

The following tables show this process by listing in the first column the key variables within each of the theoretical models identified from Chapters 2, 3 and 5 respectively¹. The second column then abstracts further from these variables to identify the broader variable at play. So for example, the theoretical model in Chapter 3 references a heuristics-based dynamic capability as a first-order variable. This is a “type of capability”. That is, while in the case heuristics-based dynamic capabilities were pertinent owing to a range of contextual circumstances, other circumstances may require routine-based capabilities to provide the needed resilience. But the overall point is that building a capability in resilience requires understanding what type of capability needs to be developed to suit particular circumstances. These higher-order constructs identify the critical underlying parameter in building a capability in resilience.

¹ Chapter 4 examined experiences in adopting the engaged scholarship method and complementary processes rather than factors relevant to the thesis research question.

Once higher-order constructs were identified, further analysis made it apparent that each could be classified as either an antecedent to the conditions to hand, an internal factor in shaping response to this context or an outcome resulting from the responsive action. These latter three categories then enable portrayal into a theoretical framework, which is shown as Figure 2 below.

This figure represents a composite model of all factors identified as salient within the models presented through the thesis. It frames a generalized and integrated answer to the research question by showing 1) the salient antecedents that affect how firms can build capabilities in resilience, 2) the internal organizational factors largely governing how firms can build capabilities in resilience and 3) the outcomes affecting how firms can build capabilities in resilience, whether based on routines or heuristics. Resilient re-integration, also known as positive adaptation to adversity, is derived from the ability to transition from routines to heuristics and back as conditions demand, whether through exogenous environmental velocity or endogenous strategic and resource collapse.

In short, firms can build capabilities in resilience by considering the questions across the range of antecedents, internal factors and outcomes identified. Answers to these questions will affect the make-up of the capabilities developed. Ignorance of these factors is likely to undermine resilience capability development.

Table 4: Variables highlighted from Chapter 2 as Salient to the Research Question

Variables identified in Theoretical Model	Higher-Order Construct	Type of Variable
Process model	Practitioner Theory of Resilience (process vs trait)	Internal factor
Threat dimensions (severity, complexity)	Anatomy of threats	Antecedent
Strategic, operating, resource disorganizations	Anatomy of disorganizations	
Routine or heuristics-based responses	Type of capability	Internal Factor
Intended outcomes from resilience, eg. Return to homeostasis vs growth	Reintegration Orientation	Internal factor
Actual outcomes from resilience, eg. extinction, return with loss, return to homeostasis	Outcomes from resilience	Outcomes

Table 5: Variables highlighted from Chapter 3 as Salient to the Research Question

Variables identified in Theoretical Model	Higher-Order Construct	Type of Variable
Advantage oriented versus stability-oriented	Degree of operating stability	Antecedent
Decline-Collapse-Re-build sequence & Inflection points	Anatomy of decline & re-building	Antecedent
Heuristics	Decision context of Actors	Antecedent
Heuristics-based dynamic capability	Type of capability	Internal factor
Re-collapse, return to homeostasis, new capabilities, new firm	Resilience outcomes	Outcome
Strategic and resource collapse	Anatomy of disorganization	Antecedent
Strategy, resource, communication heuristics	Anatomy of capabilities	Internal Factors

Table 6: Variables highlighted from Chapter 5 as Salient to the Research Question

Variables identified in Theoretical Model	Higher-Order Construct	Type of Variable
Flawed actions taken during collapse and the flawed assumptions on which they are based	Practitioner theory of resilience	Internal factor
Collapse trap	Reintegration orientation	Internal factor
Purposeful learning and capability building for decline and re-building	Anatomy of capabilities	Internal factor
Forming opportunities from individual skills and engaged partner resources into collective actions	Type of capability	Internal factor

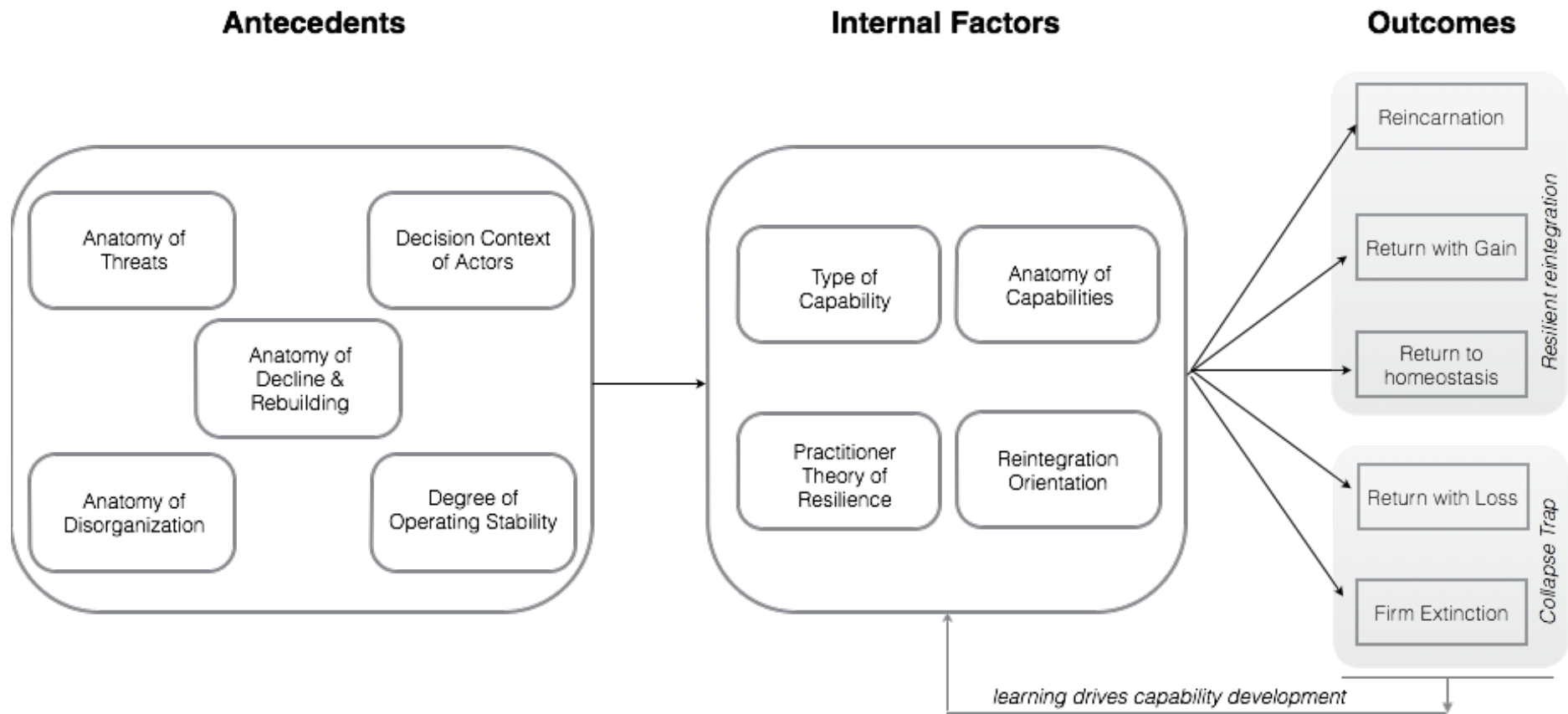


Figure 2: An integrated model of resilience capability showing how the firm learns, through iterations of responses and consequent outcomes, from various adverse incidents.

The Model Explained

Antecedents A resilience capability is not a capability with fixed boundaries. Nor is it some concrete thing that is picked up and deployed as the same capability, the same way each time. Rather, a resilience capability is a dynamic capability, which means that it consists of a repertoire of knowledge, skills, heuristics and processes learnt from adversity experiences but whose configuration needs to be judiciously selected from this repertoire depending at least on the set of antecedents faced. Through multiple deployments with these configurations firms learn which capability elements are required for particular sets of antecedents. A resilience capability develops when this learning becomes embedded into conscious resilience capability development that can be used in future scenarios.

The thesis research highlighted at least five main groups of antecedents which affect how a resilience capability is developed. The anatomy of threats faced (type of threat as well as severity, familiarity, complexity, catalysis and frequency) and the type and degree of disorganization (strategic, operating, resource) experienced by the firm affect what is learnt and the consequent repertoire of knowledge, skills, heuristics and processes that are built in relation to resilience. Figure 2 in Chapter 3 modelled the anatomy of a sequence of decline, collapse and re-build. This model indicated how different tactics were required, at least in terms of heuristics, at different boundary transition points along this trajectory. This adds a temporal dimension to a resilience capability, which reflects a process of moving through different phases to accomplish positive outcomes. Therefore, the anatomy of the decline and re-building process also affects how firms build resilience capabilities.

A key finding from empirical data concerned the importance of heuristics as the most efficient and suitable way for the firm's managers to manage collapse and steer on a path away from a collapse trap or death towards rebuilding. Heuristics were shown to be an important part of the make-up of the developing resilience capability because alternatives like deploying routines had become unavailable, since resources were decimated. The loss of staff, cash and vital assets all destroyed previously available routines that could be called on to stem decline. Instead, resource deprivation imposed constraints on the options available to managers to deal with threats. This analysis reveals that the decision context of actors is also important to how firms build a resilience capability. In resource-deprived circumstances, heuristics become a key part of the make-up of a resilience capability. In less severe episodes of adversity, key resources and assets may remain intact and so routines and heuristics together may be part of the resilience capability make-up. Therefore, the constraints and opportunities in the actor's decision context (eg. degree and nature of resources available, speed of response required) affect how firms build resilience capabilities.

The model captured this tension between constraints and opportunities in the actor's decision context through the notion of the threshold of operating stability. Above this threshold suggests sufficient resources remain available with strategy intact. Strategic and resource sufficiency impact on how a resilience capability is developed to cope with adversities. Such a comparatively healthy state of affairs makes a greater range of resources and tactics available to maintain resilience across a range of operating conditions. However, if this process is mismanaged or the threat worsens, the firm can plummet into unstable operations. Within this zone, my data suggests seeking stability replaces the pursuit of competitive advantage as the primary focus.

Fewer and less stable resources and the possible collapse of the firm's strategy both can trigger a downward spiral calling for a different, more resource-constrained, actions. Therefore, how firms build resilience capabilities is also predicated on the degree of operating stability being experienced by the firm. The complexion of resilience capabilities can therefore be different above and below the line of operating stability. Nevertheless, these five discrete elements given in the model shown in Figure 2 above require consideration to properly frame responses to the factors antecedent to the onset of adverse conditions.

Internal Factors The foregoing discussion indicates that the nature of resilience capabilities can be different based on the set of antecedents faced. For example, organizational resilience could take the form of a heuristics-based dynamic capability as occurred in the study underlying this thesis or, absent survival challenging conditions, resilience could adopt routine actions. Building a resilience capability calls for an understanding of the anatomy of capabilities, with special attention to how the individual knowledge and skills of actors cohere into collective processes.

The conceptual analysis of the resilience construct in Chapter 2 predicts the practitioner's cognitive frame will have a profound effect on how resilience capabilities are developed. Further, the outcome is impacted by the framing of resilience as a trait, implying the assembly of protective factors such as resource slack to offset adversity (eg. Cheng & Kesner, 1997; De Carolis et al., 2009), or as a process requiring different components at different times before, during and after adversity. These questions highlight how answers to these underlying assumptions will affect how firms build resilience capabilities.

Another key assumption within the cognitive frame of decision makers is the orientation to reintegration. The concept of reintegration was introduced in Chapter 2, reflecting the intended goal to improve performance as a consequence of navigating adverse conditions (derived from Richardson, 2002). Reintegration orientation then, as part of the practitioner's theory of resilience, affects how a resilience capability is developed and to what intended ends. As an orientation, a return to homeostasis is likely to be less opportunity-seeking than an orientation towards growth and renewal. The eight propositions included in Chapter 2 that explore various contributions of specific heuristics serve to underpin such a growth orientation.

Outcomes Figure 2 above divides outcomes into two distinct groups: those outcomes where performance returns to or exceeds performance levels existing prior to the onset of that particular adversity (grouped as resilient reintegration) and those outcomes whereby performance decline results (grouped as representing the collapse trap). The resilient reintegration outcome posits that the firm can learn from disruption to modify internal responses to antecedent conditions.

Considering different scenarios in the trajectory of the focal case indicates a more generalized articulation of how the components of antecedents and internal factors combine to yield particular outcomes and the impact delivered. Reviewing the case data acts as a test of how effective the model can be in real time conditions.

The first scenario considered is the period when the focal case crossed the threshold of operating stability. This traversing of the threshold is marked as occurring in mid 2003 coinciding with a major retrenchment round. With regards to the conditions antecedent to the decline, the decision context of the actors can best be described as

optimistic, certain as they were of the technical superiority of their wireless media platform. The threats were defined by uncertainty about how the wireless space would develop, particularly in terms of developing applications that customers would pay for. In this regard, ActiveSky had a strong case for optimism and confidence in navigating the uncertainty, having struck a commercial arrangement with a major sports brand to deliver then novel sports information services to wireless devices. While decision making was at times chaotic within the firm, operating processes worked smoothly enough with the firm investing in project managers, quality control and product testing facilities indicating a stable operating culture. In that regard, there was no evidence of an awareness of, nor expectation for, a future decline.

In terms of internal factors that impacted at this time and indicated in the case, capabilities covered areas of technology development and business development and were built on the assumption of resource sufficiency, proving robust to changes in strategy but not robust to collapse of resources. The continued decline and subsequent collapse of resources and strategy prove this point. No real evidence of a practicing function of resilience presented during the study, nor any actions that might have rendered a future reintegration into a different capabilities mix. The firm lived in the here and now, assuming its own technical superiority would win business growth.

The second scenario arose when the firm's strategy for business growth could not be sustained, given the constraints of available cash and their inability to leverage the existing sports information service to gain additional similar revenue streams, resources were shed. Capabilities collapsed as resources dissipated, routines of action could not be sustained and no new strategic opportunities were created. At this time,

the focal firm behaves unexpectedly. The indicative outcome should have been firm extinction and the steps the venture funds undertook next, in surrendering their control over the firm, supporting the view that this was a widely held stakeholder expectation. Yet the firm survived through the persistent efforts of a small cell of committed actors, sufficiently to engineer a rebuilding of capabilities. The model reflected in Figure 2 helps explain how this mechanism of unexpected persistence arose. Why it arose perhaps falls best within the domain of founder identity (Powell & Baker, 2014). Why persistence was sustained reflects sufficient venture progress as a function of survivor efforts (Gielnik, Spitzmuller, Schmitt, Klemann, & Frese, 2015).

The third scenario is shown through the expectation by the firm of the gains flowing from its perceived technological superiority. With that entrenched mindset, no other strategy that addressed different consumer uptake scenarios was considered. Also following that mindset of large corporate thinking, perhaps akin to the “too large to fail” mindset of some firms in the banking industry during 2008 (Agarwal et al., 2009), there existed a significant degree of routine rigidity so that when resources dissipated, activities were not adjusted for fear of failing to realise the envisaged market dominance. When the firm collapsed, these mindset constraints also evaporated and into this vacuum emerged the individual skills and aspirations of the survivors. These survivors now had no resistance to build new activities around personal preferences rather than mandated sequences by remote stakeholders. In that sense, this rebuilding was an exciting time, as reported by several informants. They now had free hand to rebuild the firm in ways they had always preferred to do but were blocked by a hubristic culture and strategy development regime controlled remotely (cp. Hayward, Forster, Sarasvarthy, & Fredrickson, 2010).

The fourth scenario arises from the fact that these survivors experienced some success and were able to live for a short period before collapsing again perhaps indicates more a lucky break (cf. Gielnik et al., 2015), since no practical appreciation of resilience existed within the firm during this first collapse episode. With the arrival of the second collapse sequence, however, evidence emerges of learning by the survivors. Some preparation for future disorganization and striving for stability is demonstrated by the proactive steps taken to embrace unstable resources, accessed through alliance partners. Prior to the first collapse episode, the firm sought to own everything itself, in an effort to control its own resources and, as imagined, therefore control its own strategy and destiny. When this became impossible following strategic and resource collapse, the survivors learned to negotiate resource access with partners, even when this meant sharing the spoils of any gains through equity allocations or profit sharing deals.

By the time of the third decline/collapse sequence, the survivors had some experience at capability dismantling in anticipation of a future resource hibernation and so have proven to keep alive sufficiently to maintain the option of rebuilding while existing in a dormant state. The outcome of this hibernation may well be eventual firm extinction but the sole remaining technology development option through a loyal alliance partner offers the prospect that the firm could still reincarnate itself into an entirely different firm from the wireless media publishing platform it once represented. Alternatively, the firm could leverage the radical shifts in wireless technology that have occurred while it has been dormant (with regards the innovations from Apple and Samsung, as well as other players in the wireless ecosystem) to rebuild itself into a thriving, resilient and capable outfit that emerges from

these sequences of collapse stronger and more able than it was at the time it entered its first collapse.

The model represented in Figure 2 above does not seek to dictate which combinations of parameters as antecedents and internal factors will yield the best outcomes. It does, however, seek to identify the parameters that require consideration across a multitude of possible combinations so that the survivors who persist can focus on the combinations available to them, or at least to nurture a possible combination along with partners they can attract to build new capabilities and gain an outcome that is better than walking away.

6.4 CONTRIBUTIONS, THEORETICAL IMPLICATIONS & FUTURE RESEARCH

The thesis has contributed to a range of literatures including organizational resilience, dynamic capabilities, heuristics and engaged scholarship. These contributions and implications along with prospects for future research are now discussed.

6.4.1 Capabilities

Capabilities are commonly viewed as a hierarchy (Gavetti, 2005), with resources forming the base of that hierarchy, reliable and robust routines applied to such resources form operating capabilities and the reconfiguring of such routines and the creativity of innovation forming the dynamic capabilities apex of the hierarchy (Hine et al., 2014). Organizational capabilities are the end result of a process of learning within the firm, where resources are linked in stable and routine ways to achieve a desired outcome and those linkages become increasingly more effective and efficient

over time (Schreyögg & Kliesch-Eberl, 2007; Zollo & Winter, 2002). Dynamic capabilities are *“the firm’s ability to integrate, build and reconfigure internal and external competencies to address rapidly changing environments”* (Teece et al., 1997: 516), representing specific and identifiable processes (Eisenhardt & Martin, 2000).

A central tenet in this study has been to explore collapse of resources, which must mean a collapse in routines since routines of action rely on stable resources for their effect. The hierarchical view of capabilities suggests that absent routines, a firm cannot possess capabilities. Yet this study has shown that a firm can remain capable despite the loss of reliable and robust routines of action. Loss of routines means operating instability, but it can still capably achieve desired goals if efforts focus on stripping resource consuming assets, forming new opportunities and rebuilding collective sequences of action toward regaining stability.

Such a conceptualization places dynamic capabilities, being the capacity to attract, reconfigure, learn and adapt, as central to gaining operating stability (under adverse conditions) or sustaining competitive advantage (under promising conditions). While this conceptualization has already garnered acceptance in the pursuit of performance under conditions of strategic and resource sufficiency (Eisenhardt et al., 2010), the role of dynamic capabilities has attracted far less attention for firms facing strategic and resource collapse.

Yet questions remain to be answered, particularly in terms of how dynamic capabilities shift as the firm changes from a survival focus (below the threshold of operating stability, as depicted in Figure 1) to a performance focus (above the threshold). Further research into this capabilities change may derive additional insight into the origins of capabilities (Winter, 2012) and also when routine based capabilities

are best applied, rather than capabilities drawing on heuristics or entrepreneurial action. These alternative states and consequential expansions of the capabilities construct collectively represent conditions of (perhaps transient) strategic and resource sufficiency. While some research is emerging on transient as opposed to sustained competitive advantages (D'Aveni et al., 2010; McGrath, 2013) more research is required to expand the capabilities framework and apply this to provide real time advantage to managers and entrepreneurs facing unstable, transient or uncertain conditions.

6.4.2 Resilience

Adverse conditions impact every firm yet not every firm sets out to withstand the almost inevitable future set back (Barney, 1991). This study has taken the setting of adverse conditions as these applied to one firm and explored not only how the firm managed to survive but also how it deliberately sought to make itself more resilient in the process. This approach is different to resilience being regarded as an adaptive quality where failed firms allow for knowledge dispersal that benefit other firms (Välikangas, 2007). The study has also been specific in pursuing real time benefits for firms experiencing collapse, rather than general frames for organizational resilience (Hamel & Välikangas, 2003).

The models presented in the study place organizational resilience as a key and central part of the suite of dynamic capabilities a firm needs to possess or learn in real time so it can overcome rigidity and attract new resources, devise new strategy and regain operating stability. The resilience loop goes further, by advocating the continued development and reinforcement of resilience even when the firm is not buffeted by shocks during performance periods when it can focus on sustaining its

competitive advantages. The loop invites managerial skill development in both routine and heuristic based capabilities during promising and adverse conditions, with the mix of each capability set shifting according to these circumstances.

The foundations of resilience capabilities as these are applied to phases of dismantling and rebuilding need greater definition. Resilience reflects complex social phenomena between actors but is a requisite parameter for navigating uncertainty (Weick & Sutcliffe, 2007). Navigating uncertainty with the proposed step sequence of both Figure 1 and Figure 2, needs confirming and likely expansion across a wider range of cases and conditions. In this process, the resilience construct as it applies to organizations will gain greater clarity, consistency and applicability.

The foundations of organizational resilience, derived from the deep and extensive tradition across psychology, ecology, engineering and the management sciences, were explored in Chapter 2 and applied in Chapters 3 and 5. The analysis sought to articulate a set of robust assumptions where firms are developed to be the opposite of fragile yet not rigid in the way they respond to adversity (Taleb, 2012). The model invites further research about the parameters included and the way they interact towards achieving particular outcomes. The desirability of the various outcomes under particular adversities also requires further research across a range of conditions.

6.4.3 Heuristics

While heuristics have recently been applied as an alternative to routine based actions within firms for management science (Bingham & Eisenhardt, 2011), the logic of why heuristics work is also a developing research front in psychology (Gigerenzer, 2008). The thesis places heuristics centrally to its modelling, sequencing them in an arc of action as different stages of the capability decline-collapse-rebuilding trajectory.

Routine actions have been a mainstay of the capabilities based view and have been viewed positively as sources of change (Feldman & Pentland, 2003), innovation (Ventresca & Kaghan, 2008), learning (Miner, Ciuchta, & Gong, 2008) and problem solving (Dosi, Faillo, & Marengo, 2008), negatively as sources of inertia (Gilbert, 2005) and both positively and negatively as sources of bias (Gigerenzer & Brighton, 2009; Tversky & Kahneman, 1974).

An underlying assumption derived from this study has been that managers seek simple rules to apply to the complex problems they encounter. Heuristics simplify the amount of cognitive processing required as the actors face fast moving, unstable and ambiguous conditions. By practising a range of rules that can be applied to a bounded set of conditions, such uncertainty enable strategies that can be more readily navigated (Mousavi & Gigerenzer, 2014). This example assigns a central role to such rules and proposes a chain of deployments of these rules to address the instability and ambiguity of strategic and resource collapse. The range of heuristics to be deployed is a clear avenue of further research as is the phenomena of heuristics themselves, including how they originate, their structure and their function over time.

This research adds to knowledge of the role of heuristics and how firms learn them (Bingham & Eisenhardt, 2011; Bingham & Haleblian, 2012) by framing these simple rules as an alternative to routine based capabilities. Heuristics are more defined than ad hoc decision making (Winter, 2003) or entrepreneurial action (Teece, 2012), framing how options are interpreted, the style of response best suited and how future responses can be tuned in line with learning from previous experience. While some attempts have been made to define a foundational repertoire of heuristics as these may apply to management practice (Mousavi & Gigerenzer, 2014) and even the building of

resilience frameworks (Madni & Jackson, 2009), further research is required on base heuristics (if these exist) that apply across all organizational conditions and the specific development trajectories such rules undergo under a variety of real time conditions. Such research need also investigate how firms best function in combining routine based and heuristics based capabilities across an array of operating conditions.

6.4.4 Engaged Scholarship

Engaging researchers with practitioners is an approach that seeks to increase the relevance of rigorous research to both theory and practice. This thesis has provided an example of its application, yielding both real time assistance to decision making as problems were solved as well as outlining a 15 step activity sequence across four phases of delve, test, innovate and unlock. These phases represented the real time application of the generic engaged scholarship method.

This example demonstrates how such deep engagement can overcome a common fear of loss of objectivity and rigor in building new theory, to yield insights and understandings likely unobtainable by other research methods. The construct of organizational collapse is not widely researched (Diamond, 2011), yet its threat impacts the vast majority of firms. The deep engagement method deployed in this project has offered some new parameters and combinations of existing parameters, to view the collapse phenomena differently than firm extinction at the end of a linear decline. The rich data exposed by this method has allowed more of the complexity, uncertainty and arising opportunities to be harnessed to further the firm's survival.

Future research can take the identified capabilities and heuristics along with the nominated sequences of application to uncover the array of conditions where they are best applied and circumstances where they are not properly applied. This example

shows how impact can be achieved with academically rigorous research that is relevant to both researchers and practitioners.

6.5 PRACTICAL IMPLICATIONS

The engaged scholarship methodology was used because an emphasis could be placed on real time assistance to the focal firm. The practical implications of the models presented can be directly derived from the real time assistance experienced by the focal firm as the research progressed. Firstly, by identifying business practitioners as actors that are skilled in choosing and applying heuristics to the problems they encounter in real time, the sequence of boundary transitions offered in Figure 1 of this chapter (and figures 2 of both empirical chapters 3 and 5) provides a clear opportunity for practitioners to anticipate likely next steps, while entering the unstable arena of strategic and resource collapse. These models aren't so prescriptive as to limit action or constrain agility but do provide some guidance as to likely states to emerge and the remedial rules that have been distilled from a complex focal case. The idea of a resilience loop extends the model so that managers can build routine and heuristic based capabilities suited to good times as well as difficult times.

As an example, had the key decision makers in the focal firm adopted a resilience perspective and anticipated adverse conditions rather than assuming an increasingly positive environment for their technology, they may have paid more attention to resource selection in the early days, matching resource growth to revenue growth rather than market hype. This practical view generally conforms to the notion of being hungry for profit rather than growth while still in the early start up phases (Christensen & Raynor, 2003). As the focal firm learned new resilient orientations, it

was able to sustain a collapsed state for an extended period while also retaining an ability to rebuild, should the survivors so choose.

Secondly, by identifying key parameters for antecedents and internal factors, and outlining a range of outcomes resulting from how these parameters can interact, managers can focus their cognitive problem solving process on high impact components of their firm and consider a range of scenarios across those options. Real options logic, as it applies to sequencing of opportunities, constraints on initial commitments and retaining an ability to reallocate resources when bets fail (Klingebiel & Adner, 2015), informs the internal factors at play. While significant further work is required to understand the various combinations of antecedents and capabilities as noted in the previous section and the boundary conditions that may apply to each combination, the knowledge of the parameters themselves informs practical action, providing some focus to how managers can assess complex, unstable conditions towards configuring accessible resources with available activity sequences using simple rules toward harnessing desirable outcomes from such uncertainty.

6.6 CONCLUSION

ActiveSky began with great promise and very quickly attracted high levels of investor and technology developer interest, endowing (or burdening) it with great expectations among the early participants. After gaining initial strong traction in the uncertain wireless marketplace, those expectations were dealt a series of all but fatal blows as it dived into decline and collapse, several times in succession. As a participant, I began this research to better understand the reasons for that series of events; to gain insights into the dynamics of an uncertain market, the strategic

missteps, the misjudged opportunities and both forced and unforced resource-allocation errors. What stands out most strongly of all is how the firm survived these successive, adverse conditions, instilling a resilient capability so that it could continue to rebuild several times.

Despite its promising beginnings, ActiveSky has not achieved high growth performance. It is not an exemplar for other entrepreneurial firms with high growth aspirations to emulate. While holding out against the odds, it has not been successful in eventually coming out on top. Yet it is a compelling case in what firms can do to survive collapse and it is the lessons about organizational resilience and the choices made to instill them that I have explored in this thesis. Given the high rates of failure of entrepreneurial firms (Bhidé, 2000) and the inadequate attention to the empirical and conceptual study of organizational resilience, this research makes four key contributions.

Firstly, it provides empirical evidence of the dual nature of the dynamic capabilities construct (Peteraf et al., 2013). Dynamic capabilities can be the central change mechanism, driving reconfiguration of existing resources and routines (Zahra, Sapienza, & Davidsson, 2006) and also creating opportunities that require resources and alliances not yet available, exploited by entrepreneurial actions that have yet to evolve into newly discovered or newly created opportunities (Alvarez & Barney, 2007; Barreto, 2012). In the tradition of a capabilities hierarchy, where dynamic capabilities sit atop operating capabilities, resources and the routine actions (Hine et al., 2014), their purpose serves as the value engine for sustained competitive advantage (Teece et al., 1997). The model in Figure 1 frames this space as occurring above the threshold of operating stability.

Yet dynamic capabilities can also be unstable actions of change that may not always be sustainable (Eisenhardt & Martin, 2000), not only in high velocity markets but also under conditions below the threshold of operating stability, as indicated in Figure 1. Conceptual arguments of this duality frame dynamic capabilities in terms of the speed of environmental change (Peteraf et al., 2013). This research broadens that argument to also embrace unstable operations where strategy gaps have emerged or even failed altogether and resources have dissipated to the point of collapse. This means that firms can exist, even without capabilities defined as actions of reconfiguration of resources, providing they are still able to form new opportunities and undertake heuristic-based actions to attract access to resources sufficiently to complete tasks of rebuilding. Dynamic capabilities are shown as the central engine of a resilient firm under any conditions, of high or low environmental dynamism, strategic coherence or collapse and resource sufficiency or instability.

This argument does not presume to claim that the resilience capability loop is secure and repeatable. Rather, I argue that heuristic-based capabilities, in addition to routine-based capabilities, allow a firm to navigate unstable conditions of decline and collapse and to cope with the strategic uncertainties such conditions engender. I frame routine-based capabilities, both dynamic and operating, primarily as the domain in pursuit of sustained competitive advantage goals during times of strategic coherence and resource sufficiency. I frame heuristics-based capabilities primarily as the domain pursuing stability, under conditions of uncertainty and instability when the very survival of the firm is in question. I also argue that different skills are required for routine-based capabilities compared to heuristics-based capabilities. Without the ability to transition between these two types of dynamic capabilities,

continued decline of the form experienced by the case study will lead to paralysis, as survivors have no means of sustaining routine actions. Such paralysis, left unchecked, must eventually lead to firm extinction, as so many turnaround trajectories assume (Chowdhury, 2002). The study indicates that renewal from decline resulting from strategic and resource collapse can be achieved with heuristics-based dynamic capabilities as the engine of new opportunity formation.

Secondly and distinct from the discussion of dynamic capabilities as either routine-based or heuristics-based, the role of heuristics in enabling the exclusion of information as a means to make better decisions when navigating conditions of great uncertainty, whether high velocity or not, has only recently gained currency (Mousavi & Gigerenzer, 2014). The idea of frugal rules has been in the organizational domain for some time (Eisenhardt & Sull, 2001) and is gaining increased attention (Bingham & Eisenhardt, 2011). The model depicted in Figure 1 presents an iterative series of heuristic actions, framed to address changing contexts of strategy, resources and communications between survivors navigating unstable conditions of imminent extinction. The loop of sectors and transitions builds on fast and frugal rules to focus on key elements of a context and to exclude information the case data suggest distracts from productive action. These heuristic sequences are presented as a central element of a resilient organization, dismantling routines as decline proceeds and drawing on inherent individual skills, biases and asymmetries to build a capability creating organization (Miller, Eisenstat, & Foote, 2002).

Thirdly, in undertaking a multi-disciplinary review of the resilience construct through the four domains of psychology, ecology, engineering and organization science, I have sought to focus on positive adaptation to adversity (Martin & Sunley,

2015), otherwise known as post-traumatic growth (Masten, 2014). This framing presents resilience as the robust quality to reap long term benefit from adverse conditions, benefits that would not have been achieved absent the adversity. This orientation renders adversity as a potentially beneficial impact that yields positive growth and resilience as a fundamental quality to supplant organizational fragilities (Taleb, 2012). As summarized earlier, in the management sciences the resilience construct has received quite general consideration, offering inconsistent and often simply developed underlying mechanisms, in need of further development (Bhamra, Dani, & Burnard, 2011).

Some organizational resilience frameworks have begun to align with and build on the capabilities construct, even embracing both desirable and undesirable characteristics that highlight system adaptation built on dynamic capabilities (Limnios et al., 2014). The manifestation of resilience capabilities, given in Figure 2 above, show the antecedents to adverse conditions arising as separated into five distinct parameter groups. These antecedent conditions are then addressed by the four internal capabilities and orientations of the firm. This reaction to adverse conditions, in the context of existing antecedents, shapes the type of outcome the firm can hope for in the circumstances. There may well be circumstances where firms should cease (Dew, Goldfarb, & Sarasvathy, 2006) but I have explored here the actions required where firms choose to persist (Powell & Baker, 2014), despite the apparent odds against such persistence.

In a more general way, the model presented in Figure 2 outlines the factors at play in terms of antecedents to adversity and how equipped the firm is to react to such adversity in terms of their internal capabilities, capacity to act resiliently and to

chase a positive reintegration. This model does not indicate that resilient reintegration is always the best choice; without commitment of survivors to learn, adapt and be agile, it may well be time to extinguish that firm (Dew et al., 2006). But should these survivors of collapse choose to persist, this model indicates the parameters that interact toward achieving a particular outcome.

Fourth, this research project has explored a relatively under-researched arena of firm collapse (Wilkinson & Mellahi, 2005) using a relatively uncommon methodology of engaged scholarship (Deetz, 2008) to build new theory that assists both researchers and practitioners alike in understanding how strategic and resource collapse can be navigated. The modeling presented in this thesis articulates the underlying parameters and forces that can benefit other firms that seek to survive through deeply adverse conditions. Through academic-practitioner engagement, I have sought to deliver research that is not only useful to practitioners (Mohrman, Gibson, & Mohrman, 2001) but also rigorous in its application and interpretation, so cementing rigor and relevance as a central premise for engagement and discovery (Starkey, Hatchuel, & Tempest, 2009).

Taken together, these insights contribute to the toolkit for managers to anticipate and positively adapt to adverse conditions, as well as to the conceptualization of firms as capable even when capabilities appear to have evaporated. This thesis has taken lessons from a period of organizational collapse observed at close quarters and, from that vantage point, pointed a way towards building organizational resilience as a capability to be learned and applied across all operating conditions.

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