How do business models evolve in practice? A complex-adaptive perspective

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

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Date of Submission:
15th November 2017

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ABSTRACT

Firms in the high-technology sector must navigate an environment that is dynamic and fast-moving. It is an environment that displays continual disequilibrium and witnesses regular shocks. In such a discordant environment, traditional top-down modes of strategic planning struggle to generate sufficient flexibility and speed of change necessary for a firm to maintain environmental fit over time. Instead, to co-evolve with its environment a firm, and in particular, its business model(s) must adapt constantly. To achieve this, significant decision-making must necessarily be located in the operational layers of the firm. To understand how the resulting multitude of small decisions result in change(s) to the firm's business model, I conduct a multiple-method case study on Cisco as a kind of phenotype in the high-technology sector. Cisco is a firm whose business models have the capacity to change themselves in response to external stimuli. Through a strategy-as-practice lens, I establish that Cisco's business models exhibit characteristics of complex adaptive systems and function analogously to them. I suggest the notion of a complex adaptive business model is theoretically located in evolutionary economics and emergent strategy instead of neoclassical economics and mainstream strategy. Consequently, I recommend the firm perceive itself as the facilitator and orchestrator of the business model rather than the controller of it. To guide the business model, I recommend the firm embrace an overall strategic framework that provides high-level rules and boundaries but otherwise allows the business model to develop freely. Such freedom has both positive and negative implications. For firms housing or seeking to establish a complex adaptive business model, I highlight the firm's own high-level purpose must be clearly resolved and cultural and structural adjustments inside the firm be made.

Keywords: adaptation, business models, complex adaptive system, disruption, dynamic systems, strategy, CAS, complex adaptive system, Cisco, complexity, complexity economics, complexity management, emergence, emergent strategy, evolution, evolutionary economics, firm purpose, firm structure, high-technology sector, human resources, leadership, strategy, strategy-as-practice, strategic decision making.

STATEMENT OF ORIGINALITY

This is my original work and has not been submitted for a higher degree with any other university or institution. My research has been fully approved by the Macquarie University Ethics Office with the approval reference of 5201400606.

Signed: _____

Date: _____

DEDICATION & ACKNOWLEDGMENTS

Dedicated to my children. Aim high. Learn for life.

To my supervisors Dr. Lars Groeger & Dr. Kyle Bruce. While there are so very many things I could thank you for, most of all, I would like to thank you for your, guidance, help, mentoring, and friendship. This has been a long journey that we have taken together and I am, by far, the richer for it.

1 INTRODUCTION

It is virtually axiomatic that actors at any level in contemporary business organisations will regularly invoke or at least be aware of the term 'business model' (Afuah & Tucci, 2002). Since the origination of the concept in the 1960s (Jones, 1960) business models have become so pervasive that every firm is considered to have a business model whether they acknowledge it or not (Chesbrough, 2007). The concept is ubiquitous because it is amorphous and can be used with validity in multiple contexts for multiple purposes (Baden-Fuller & Moran, 2010). This means a practitioner's response to a business model is typically a reflex action and tends to correlate with pre-existing perceptions of how a particular firm 'does its business', with popular business models witnessed in the wider environment (e.g. the 'Netflix business model'), or with a previously documented business model type (e.g. 'the razor & blade business model'). A bifurcation in extant conceptualisations of business models is also evident. They are perceived as either static, fixed at a point in time, for example, as representative models (Osterwalder, 2004; Osterwalder & Pigneur, 2010; Baden-Fuller & Morgan, 2010; Afuah, 2015; Doleski, 2015; Baden-Fuller & Mangematin, 2015) or else operational over time and interacting with the wider economic environment (Casadeus-Masanell & Ricart, 2010).

This bifurcation highlights that there are tensions in the theoretical constitution of the concept (Klang et al., 2014). It is in this context that Teece (2010: p.174) has asserted "the concept of a business model has no established theoretical grounding in economics or in business studies". This observation is only partially true. The static view of a business model has "rich theoretical roots" (Amit & Zott, 2015: p.332) and is firmly grounded in the Porter view of strategy (Porter, 1996), the resource-based

theory of the firm (Penrose, 1959; Wernerfelt, 1984; Barney et al., 2001), and transaction-cost economics (Coase, 1937; Williamson, 1981).

The grounding for operational business models, however, is less certain. Operational business models have been most often associated with dynamic capabilities (Teece et al., 1997, Teece 2010) and Porter's Value Chain and/or Activity System concepts (Porter, 1985, 1996). Nevertheless, this grounding is challenged in a real-world environment because it struggles to account for how business models respond to constant changes in the economic system without a number of simplifying assumptions. Indeed, faced with the difficulty of explaining how business models adapt and evolve, many scholars simply equate business models with a firm's strategy, even when attempting to differentiate between the two concepts.[1] Establishing a direct nexus between business models and mainstream strategy is paradigmatically neoclassical and this is what I will hereafter refer to as the *mainstream perspective* on business models.

In contrast to the *mainstream perspective* on business models, a smaller number of authors have advanced an alternative theoretical grounding for operational business models (e.g. Voelpel et al., 2005; Johnson et al., 2008; McGrath, 2010; 2013; Smith & Tushman, 2010; Sosna et al., 2010; Kagermann et al., 2011; Achtenhagen et al., 2013; McDonald, 2013; McDonald, 2014; McDonald & Eisenhardt, 2014; Leih et al., 2015; Martins et al., 2015; Wrigley & Straker, 2016; Laudien & Daxböck, 2016). This alternative grounding is provided in emergent strategy (Mintzberg, 1979; 1987; 1994; Eisenhardt & Sull, 2001; 2012; Brown & Eisenhardt, 1989; McGrath, 2013) and in evolutionary economics (Veblen, 1898; Nelson & Winter, 1982), and thus provides an

[1] A prime example of this is Casadesus-Masanell and Ricart's (2010) article titled 'From Strategy to Business Models and onto Tactics' that refers to a business model as the firm's 'realised strategy'.

evolutionary perspective on business models. The *evolutionary perspective* treats change to the business model as an emergent process and has the potential to more accurately encapsulate how business models respond to a continually disrupted external environment (Christensen & Johnson, 2010). My own interpretation is congruent with this perspective, and in this dissertation I adopt the following definition for a business model:

> A business model is an open system that operates to create, deliver, and capture value over time for all stakeholders.

I provide my own definition because while the overall business model concept is moving steadily towards maturity (Nielsen et al., 2014), no unambiguous consensus presently exists at to what exactly a business model is (Massa et al., 2017). However consensus on a number of aspects of the concept have recently emerged across business model scholarship (Klang et al., 2014; Wirtz et al., 2015). For example, it is now broadly accepted that a business model is a *system* (Afuah & Tucci, 2002; Seddon et al., 2004; Chesbrough, 2007; Hurt, 2008; Wirtz et al., 2010; Zott & Amit, 2009; Rohrbeck et al., 2013) that includes the entire set of *activities* undertaken by the firm (Wirtz et al., 2015) and that a business model should exist to *capture value* (Osterwalder & Pigneur, 2010). Business model scholarship has also aligned on a future research agenda. After surveying twenty-one prominent scholars, Wirtz et al. (2015: p. 14) identify that the number-one priority for the field is assessing how "change and evolution" occurs in business models.

1.1 Central Research Objectives

A pivotal motivation for this dissertation is to respond to the aforementioned research priority identified by Wirtz et al. (2015), as well as to address the gap in the literature

mentioned above by Teece (2010) as it applies to *operational business models*. In short, my research explores how business models in the high-technology sector evolve in practice. More specifically, I build on Laudien & Daxböck's (2016: p.4) identification that in mature firms, "business model change is usually *not* a process that is initiated top down" and I address a situation where *no* executive-led decision to change the business model is made but the business model nonetheless changes. I focus on this situation because, as mentioned, the *mainstream perspective* – which connects change of a business model to a firm's pre-existing strategy – cannot adequately explain the ability for a business model to change *by itself* over time. In my research, I have therefore excluded *purposeful change* to the business model made by the *conscious action(s)* by the *firm's executive*. For example, I exclude addressing change to the business model in times of crisis (Amit & Zott, 2010; Foss & Stieglitz, 2014), launching a new business model to enter or create a new market space (Markides, 2015), or adopting or changing a business model due to an acquisition (Linder & Cantrell, 2001). I also exclude assessing change to the business model that results from once-off business model innovation (Chesbrough & Rosenbloom, 2002; Chesbrough, 2007; Chesbrough 2010) for the same reason(s). My primary research question is as follows:

> *How do operational business models in the high-technology sector evolve in practice?*

As per Alvesson & Sandberg's (2011) suggestion, I generated my research question by *problematizing* assumptions underlying the *mainstream perspective* on business models. This extends previous work by a select number of business model scholars who have identified several problematic foundational areas in mainstream business

model theory. For example, Massa et al. (2017) identify key assumptions in business models conflict with 'traditional theories' and Casadesus-Masanell & Heilbron (2015: p.9) have highlighted that for the equilibrium model to work in context of business models, it is assumed that "firms have identical cost and revenue structures". Teece (2010: p.174) has similarly identified that "equilibrium and perfect competition are a caricature of the real-world". However, this *effort is incomplete* because no holistic view of all assumptions that are potentially problematic for business model theory yet exists. To this end, I have traced the theoretical lineage of the business model concept. I go beyond identifying business model theory antecedents and assess deeper theoretical foundations contributed by mainstream strategy and neoclassical economics. From this assessment, I highlight that mainstream business model theory inherits three fundamental but falsified assumptions (Mirowski, 1989; Rumelt et al., 1994; Beinhocker, 1997, 2006):

1. that business models operate in a closed economic system;
2. that the economic system itself is trending towards equilibrium; and
3. sustainable competitive advantage is achievable for firms in this stable environment.

1.2 Strategy-as-practice

These criticisms provide an important connection with one of the primary motivations for strategy-as-practice research (Jarzabkowski, 2005; Whittington 2006; Paroutis et al., 2013; Golsorkhi et al., 2010; 2015), that of critically assessing assumptions made in mainstream strategy (Jarzabkowski, 2005; Vaara & Whittington, 2012). Strategy-as-practice is a cognate stream of research to business model scholarship and is particularly appropriate for my purposes because it addresses the implementation of

strategy in real-world organisational settings such as those that support an operational business model. Specifically, strategy-as-practice focuses on human activity in the creation and implementation of organisational strategy (Jarzabkowski et al., 2007). Its own emergence and ongoing popularity as a complementary approach for assessing strategy is driven by a general dissatisfaction with traditional research approaches in management and organisation studies that have:

> Largely been based on the micro-economics tradition. As a consequence, research has typically remained on the macro-level of firms and markets while reducing strategy to a few causally related variables in which there is little evidence of human action (Jarzabkowski et al., 2007: p.6).

Instead, strategy-as-practice provides an alternative perspective changing the locus of strategy from something the firm 'has', to something it 'does' or is 'doing' (Whittington, 1996; 2004; 2006; Jarzabkowski et al., 2007; Golsorkhi et al., 2015). Strategy-as-practice therefore focuses on what people actually 'do' in developing or implementing strategy (Whittington, 1996). I have therefore followed Achtenhagen et al. (2013) and Ahokangas & Myllykoski (2014) by adopting strategy-as-practice as my broad theoretical lens to address the aforementioned assumptions underlying the *mainstream perspective* on business models and to furnish an answer to my research question. I thus explore what practitioners involved with a business model 'do' as a way to explain 'how' the business model itself adapts and evolves over time in absence of a predetermined executive-led change agenda. I focus on understanding how operational, everyday decisions made by business model practitioners lead – in aggregate – to larger systemic change with the business

model. Ultimately, I am interested in determining the link that explains what happens at the micro-level and how this changes outcomes at the macro-level (Jarzabkowski & Spee, 2008). Strategy-as-practice is useful in this context because it encourages research to focus on the micro-level activities, processes and practices that relate to active strategy-making (Golsorkhi et al., 2015). I similarly address activities that are consequential to strategic outcomes (Johnson et al., 2003), whether they were known as strategic or whether the outcomes to the business model were intended or unintended (Jarzabkowski et al., 2007).

The ability for a strategy-as-practice lens to address strategy more generally is furthermore relevant because while I have situated my notion of a business model in the *evolutionary perspective*, the perspective itself contains some weaknesses, particularly when contrasted with my own research agenda. Most significantly, it remains implicitly reliant upon a firm's management to be involved with instrumenting change to a business model, a situation I have excluded. Therefore in Chapter 2 (Section 2.3.3) I leverage the conceptualisation that business models are a type of system to propose that certain business models function analogously to a *'*complex adaptive system*'* (Holland, 1992; Holland, 1996), albeit in an economic – as opposed to a natural sciences' – context (Stacey, 1996; Arthur, 1996; Arthur, 2013).[2]

1.3 Complex adaptive business models

My proposal for 'complex adaptive business models' thus extends the *evolutionary perspective* on business models into complexity science (Kauffman, 1990; Holland, 1986; Gleick, 2008; Stacey, 1995; 1996a; 1996b; 2007; Griffin et al., 1998; Waldrop,

[2] Following Stacey (2007) I do not assert that business models are exactly the same as complex adaptive systems, but function 'analogously' to them. Furthermore, I propose that only business models that have by appropriate governing conditions and also that operate in the high-technology sectors can potentially function analogously to a complex adaptive system. Please see Sections 2.3.7 and 3.3 for further details.

1993; Arthur, 1996; 1997; Arthur et al., 1997). In so doing, I highlight that the characteristics of a complex adaptive system are at odds with the three fundamental mainstream assumptions highlighted above. For example, rather than operating in a closed system as is assumed in neoclassical economics, a complex adaptive system is an open system that continuously interacts with other open systems such as the economy. Instead of trending towards equilibrium it operates with multiple possible equilibria. Instead of being a stable system capable of generating a *sustainable competitive advantage*, a complex adaptive system is typified by discordance and dynamism and is difficult to control which, in turn, challenges the ability for it to be governed or directed to any one end.

To link with the research priority of investigating change and evolution in business models, I highlight how complex adaptive business models adapt and evolve over time through a defining characteristic of a complex adaptive system: the ability to change at a system-level by employing both positive and negative feedback loops in order to aggregate the decisions of its participants without the presence of a 'global controller' (Arthur et al., 1997). In my case, the 'global controller' can be variously conceived as mainstream strategy and/or direction from senior management for a specific change. As part of my proposal, I also highlight that complex adaptive systems and/or complexity mechanisms have previously been identified in the wider economy (Arthur et al., 1997) as well as in firms (Bettis & Hitt., 1995; Sargut & McGrath 2011; Arthur, 2013) and that their unique characteristics have been adopted in economics (Arthur, 1996) as well as in strategy (Beinhocker, 1997; 2006; Sargut & McGrath 2011, Brown & Eisenhardt, 1998).

Further, I highlight that the concept of a complex-adaptive business model embraces all three concepts embraced by the strategy-as-practice literature: *practitioners*, *practices*, and *praxis* (Whittington, 2006). The premise also specifically recognises that the business model responds to feedback from larger systems to which it is connected: the firm, society, and culture. It consequently does not contradict the strategy-as-practice principle that participant decisions are fundamentally informed in this context. Finally, the concept of complex adaptive business model acts in accordance with my definition of a business model.

Ultimately, I propose that business models function analogously to complex adaptive systems as a way of providing the linkage that explains how a business model evolves in practice through the actions of its practitioners. In order to demonstrate this, I assess whether identifiable characteristics of complex adaptive systems are present in the business models I investigate. Consequently, I ask the supporting research questions outlined in Table 1:

Table 1: Supporting research questions

Characteristic of complex adaptive system	**Supporting research question**
Rules	What rules and guidelines are identifiable in the business model?
Boundaries	What boundaries are identifiable in the business model?
Agents	How does the business model empower its participants to make decisions?
Feedback	How does the business model exhibit positive and negative feedback?
Adaptation	How does the business model achieve continuous change?
Emergence	How does the business model change in unplanned and unexpected ways?

1.4 Method

My primary research question focuses exclusively on the high-technology sector. I focus on this sector because preeminent complexity science scholar Brian Arthur argues it is the best empirical location for identifying complex adaptive systems in the economy.[3] Specifically, Arthur (1996) identifies that the sector has a different structural architecture to that of traditional industry sectors and this structure enables firms to display "mechanisms of positive feedback" (p.100) that are associated with complex adaptive systems. In Section 3.2 of Chapter 3 I further expand upon why the sector is appropriate is an appropriate location for my research.

I address my research questions by undertaking an ethnographic case study on a representative firm of the high-technology sector, Cisco Systems. I choose to conduct a single case study following Gioia et al. (2013) who indicate it is possible to generalise from a single case study if concepts have obvious relevance to another context. However, *I do not seek to generalise* my results. Rather, my research demonstrates that certain business models contain characteristics of complex adaptive systems and my ambition is that results from my case study may be *transferable* (Eisenhardt, 1989; Aken, 2004) to other contexts, found in the form of Cisco's peers. Consequently, assessing Cisco as a single firm is appropriate for my purposes because Cisco itself is a kind of phenotype of other firms in its sector. More specifically sector participants, including Cisco, emulate one another in an ongoing process of "mimetic isomorphism" (DiMaggio and Powell, 1983: p.150) and consequently share many underlying traits. For example, firms often share the same

[3] Brian Arthur was awarded the inaugural Lagrange Prize in Complexity Science in 2008, and the Schumpeter Prize in Economics in 1990. Further details can be found at http://tuvalu.santafe.edu/~wbarthur/

board members and are located in tight geographic clusters meaning they are subject to the same culture, rules, laws, and regulations. I outline further similarities between sector participants that enable my research to be transferred in Section 7.1.3 of Chapter 7.

It is well established that research conducted in a familiar location threatens objectivity. *As an employee of Cisco* my first priority in conducting research was to remain objective and to critically assess data generated by my case study.[4] To this end, I actively minimised the possibility of introducing personal bias into my research by proactively assessing where I believed I might be influenced. I identified that high-risk areas were present if I was to become involved with research participants in my personal work setting, or in situations that involved high emotions (for example, high-pressure working groups). Based on this reflection, I rejected a number of potential methodologies such as action-research or auto-ethnography and instead adopted a broad definition for ethnography itself that limited my interaction to the level of 'participant-as-observer' (Gold, 1958) only.

My personal efforts at remaining objective were enhanced through the unique characteristics of case study research. Counter-intuitively, case studies have been shown to falsify preconceived views, assumptions, concepts, and hypotheses. Essentially, and unlike alternative research methods, the researcher is close enough for participants to 'talk back' which means case studies have a greater bias towards falsification of preconceived notions (Flyverg, 2006: p.20). In my case study design, I further ensured that I triangulated (Flick, 2007; 2009) data I personally collected with secondary data independently generated by third parties. It is also worth mentioning

[4] Cisco's permission for my research may be found in Appendix 14.

that strategy-as-practice supports research in situated researcher-involved contexts such as mine. For example, the editors of the *Cambridge Handbook of Strategy as Practice* support the call by Hill et al. (2010: p.296) for research which requires "closeness to or involvement with the objects of study" – notwithstanding the risk of bias and issues with generalisation that I have addressed.

1.5 Theoretical Contribution

Responding to Teece's (2010) call to develop theoretical foundations for the business model concept, I make two pivotal contributions in this dissertation. First, I provide *insight* into the business model phenomenon. Second, I *advance knowledge* in a way that is *useful for practitioners* (Corley & Gioia, 2011). In so doing, I follow Van de Ven (1989) who stipulates that a theoretical contribution in *management studies* must do both – one of these contributions alone is insufficient to meet the test inside the discipline. I briefly summarise my contributions below and discuss them in more depth in Section 7.1 of Chapter 7.

Insight into business model phenomenon

My original insight is establishing that certain operational business models can function analogously to complex adaptive systems. As highlighted above, this insight results from a situation that *extant business model theory* cannot adequately account for: the ability for businesses models to change *by themselves* in response to external stimuli. This is a real-life problem (Corley & Gioia, 2011) because it impacts daily on practicing managers.

Here, my contribution demonstrates – empirically – the presence of characteristics of complex adaptive systems in Cisco's business models and highlights how these characteristics interact to engender continuous business model change. It therefore

builds on Eisenhardt & Sull's (2001; 2012) findings that Cisco manages a complex constantly changing environment by following a number of 'simple strategic rules' by demonstrating the presence of such rules in Cisco's business models.

Advancing knowledge in business model theory that is useful for practitioners

By extending the *evolutionary perspective* on business models and grounding the notion of a complex adaptive business model in complexity science, I provide a theoretical foundation for the concept that was previously *unrecognised* by *business model scholarship*. As part of this grounding I highlight the utility of complexity theory for explaining change in similar systems such as the economy and firms. I also demonstrate how complex adaptive business model characteristics are manifested in firms and thereby empower practitioners to address complex adaptive business models in their own context(s).

Providing a grounding for complex adaptive business models that *is useful for practitioners* was greatly assisted by my problematizing the key assumptions underlying the *mainstream* literature on business models (Alvesson & Sandberg, 2011). The assumptions I identify are a further contribution to business model theory. They range from *field assumptions,* such as when a practitioner employs the concept or uses the phrase 'business model' when they do not fully understand what it means, to the three *paradigmatic* assumptions listed above. According to Alvesson & Sandberg (2011), critiquing paradigmatic assumptions is a more fundamental form of problematization. However, criticisms of neoclassical assumptions have been made previously by scholars from related disciplines, including those in the economic and strategy domains. On reflection, it appears that an 'open secret' exists in business model scholarship; it is widely known that neoclassical assumptions fundamentally

inform *mainstream* business model theory, but the implications are only mentioned in passing. I address this through my typology of assumptions that can be found in Section 6.2 of Chapter 6.

1.6 Managerial implications

My research confirms that certain business models have the capability to evolve without specific intervention from senior management or direction from strategic planners. I establish this is the case for Cisco and I propose it is equally so for Cisco's peers. Firms exhibiting high or even exponential growth simply cannot afford bottlenecks in decision-making and therefore delegation and empowerment to the maximum degree must occur. Cisco, Apple, Facebook, Google, Salesforce.com, and many others, have all experienced business acceleration virtually unprecedented in other sectors of the economy. These firms have adopted a different strategic and managerial paradigm that ultimately governs their business models. I found Cisco does not assume the environment is stable or that detailed long-range strategic planning is possible. Instead, Cisco has developed a competence for strategic short-term responsive planning. Plans are defined just before they are implemented in a similar fashion described by one of my interviewees when referring to Wallace and Gromit laying the railway tracks while the train is moving. This means that strategy formulation and implementation as a process is extremely emergent (Golsorkhi et al., 2015) and the efficacy of traditional strategic planning may need to be reconsidered (Kagermann et al. 2011; McGrath 2013, Eisenhardt & Sull, 2001; 2012; Christensen, 1997; 2011; Beinhocker, 1997; 2006). Instead, planning may fundamentally rely on directional inputs gathered from the external environment and operational layers of the firm. In this perspective, strategy 'bubbles up' rather than being determined 'top down' and, in turn, this implies that operational-level employees are often the

‘strategy makers’ of the firm albeit operating within some boundary-rules (Grove, 1996; Eisenhardt & Sull, 2015).

Consistent with this proposition at Cisco, the process of strategy-making is highly weighted towards embracing a ‘periphery-led’ model that relies on sense-making through interpretation, adjustment, and trial-and-error (Regnér, 2003). This means ‘inductive’ decision-making by those closest to the boundary between the firm and its broader environment is highly valued by the firm. Cisco consequently accepts and provides a *facilitating environment* that allows a level of failure when things go wrong. In practice, this means peers rather than senior executives provide a correction mechanism through collaborative decision-making when initiatives fail. In this way, individuals are partially isolated from personal blame and indirectly encouraged to take a level of risk they may otherwise fail to take in more traditional settings. Importantly, formalised ‘deductive’ approaches and techniques are also valued by Cisco but are employed more in a supporting or reactionary mode. In essence, once the strategic direction becomes clear the firm employs its substantial formal capabilities to assess, support, refine, describe, document, facilitate, and report on success and/or possible failure.

The weighting towards strategic sense-making at the periphery of the firm and employing traditional strategic approaches to facilitate implementation of resultant strategy, overcomes the strategy making dichotomy identified by Regnér (2003) that often arises in the way strategies are developed by executives at the centre and expected to be seamlessly and unproblematically implemented at the periphery. It similarly reduces opposition to activities that may be the “most critical for strategy outcomes” (Regnér, 2003: p.77) and therefore removes barriers for implementing

strategy quickly.

In combination, the above implies a very different role for executive management in firms that seek to encourage flexibility and/or adaptability in their business models. In particular, for operational business models, instead of controllers and approvers, senior management may become *facilitators* of the business model. Here, the most important role is to ensure the right environmental conditions are present inside the firm. Ultimately, I suggest that executives should seek to encourage and then support an open environment that encourages maximum collaboration throughout the entire business model system – that when appropriately sized (Bouncken et al., 2015) enables previously unimagined or unattainable business model innovation to occur.

A complex system is one whose participants are highly interconnected and interdependent (Eisenhardt & Sull, 2015; Reeves et al., 2016). To this end, setting appropriate *governing rules* for the business model and its participants is critical. Rules must balance strategic intent with maximum organisational flexibility; if set too rigidly space for innovation will be restricted, but set too loosely, and the business model may develop undesirably for the firm. Therefore, in conjunction with setting appropriate rules, executives should also set a *small number of boundaries*. Because the most immovable boundaries are external to the firm and found in governmental laws and regulations, business model boundaries should focus on 'no go' strategic, ethical, or moral areas for the firm. For example, 'no international expansion' is a clear boundary.

Leih et al. (2015: p.26) have highlighted that "firms with a high degree of delegation and vertical communication are often better at sensing and evaluating opportunities and threats". Once business model rules and boundaries are established, executives

should seek to *delegate and empower* employees and even external business model stakeholders to the maximum extent practicable such as, in Cisco's case, the empowerment given to its external technical support community. To do this, executives must trust that strategically effective decisions will be made at lower levels in the firm.

Finally, to complement the three critical organisational design changes necessary for a firm to successfully support complex-adaptive business models, I also recommend several *tactical design changes* that I discuss in detail in Section 6.4.2 of Chapter 6.

1.7 Organisation of the dissertation

This dissertation is structured as follows:

In Chapter 2, I analyse the business model concept. First, I outline the popularity of the business model concept. I then collate and assess different definitions for a business model before discussing my adopted definition. I outline high-level characteristics of the business model concept and highlight the importance of the relationship between a business model and a firm. I conclude by comparing the similarities and differences between the business model concept and strategy.

In Section 2.2, I outline the *mainstream perspective* on business models. I commence by arguing how the Porter view of strategy (Porter, 1980) fundamentally informs the *mainstream perspective*. I therefore discuss the relationship mainstream business model theory shares with resource-based theory of the firm, transaction cost economics, and dynamic capabilities. I then indicate that the *mainstream perspective* fails to adequately explain unexpected change to the business model because it treats change itself as mathematically predictable. To properly

demonstrate this, I trace the origins of strategy in neoclassical economics and identify assumptions that adversely impact business models through this relationship.

In Section 2.3, I outline the *evolutionary perspective* on business models and commence by highlighting how the perspective is adopted when change is treated as an ongoing process. I emphasise that change in business models themselves is typically described as 'experimentation' and/or 'trial and error'. I outline the theoretical antecedents to the *evolutionary perspective*. Following, I explain that originating scholars (e.g. Jones, 1960) introduced theoretical concepts align with the *evolutionary perspective* and recent advances in complexity science. I emphasise my proposal for complex adaptive business models is based on extending the *evolutionary perspective* into complexity science. I therefore define complexity science, outline its theoretical antecedents, and highlight its expansion into social science in the form of complexity economics and strategy. I, conclude by describing the characteristics of complex adaptive systems on which I base my proposal.

Chapter 3 is a short bridging chapter, in which I extend the characteristics of complex adaptive systems into the context of business models. I explain how business models *a priori* may be suited to being considered analogous to a complex adaptive system in the way they function. I then analyse both existing business model characteristics and, separately, characteristics of complex adaptive systems. From this assessment I generate expected characteristics of complex adaptive business models, against which I have aligned my supporting research questions. Following this, I narrow the focus on to which business models operate with sufficient flexibility to function analogously to a complex adaptive system. I confirm the high-technology sector as

an appropriate research location and demonstrate why the sector is capable of hosting complex adaptive business models.

In Chapter 4, I present my research design. To ensure rigour and suitability I follow Crotty's (1998) research design framework, adopting a constructivist epistemology and interpretational theoretical perspective. At a more detailed level, and taking account of areas where personal bias could intrude, I adopt ethnography as my methodology and a multi-case multi-method case study as my method. Finally, the case study design is outlined in depth and it is emphasised that my case study assesses Cisco's two largest business models; the Cisco Product and Services business models respectively. I also adopt Porter's (1996) activity system concept to properly codify and describe business models.

In Chapter 5, I present the results from my field research. First, I provide the complete representations for Cisco's Product and Services business models. I then provide results for each supporting research question and, finally, address my primary research question.

In Chapter 6, I discuss theoretical and managerial implications related to the concept of a complex adaptive business model. I commence by discussing my results against each characteristic of a complex adaptive business model. I then outline the implications that result from changing assumptions underlying the business model concept and provide a topology of such assumptions. This section highlights how the existing inherent benefits of business models are enhanced by the concept of a complex adaptive business model. I outline how a firm may be organised to house a complex adaptive business model, or otherwise embrace complexity principles. This

section also addresses higher-level organisational considerations and then provides tactical design recommendations that can be implemented by practitioners.

Chapter 7 concludes my dissertation by providing a synthesis of my research. I clearly outline my theoretical contribution and indicate how my results may be transferrable to Cisco's high-technology sector peers. I outline the limitations of my research and re-summarise the implications arising from my proposal.

2 LITERATURE REVIEW

2.1 Business Models

2.1.1 Use and popularity of the term 'business model'

Definitional laxity and conceptual ambiguity is a legacy of early references to the term 'business model' and notwithstanding the enduring popularity of the concept, it remains a problem to this day. According to Santos et al. (2009), the term was initially used in a research abstract by Lang (1947) and then subsequently in a listing of subject terms by Mertes (1949). Neither provided a definition or any further detail. More than ten years later, Jones (1960) referred to a 'business model' in an article title without subsequently discussing the concept anywhere else in the text.

In the contemporary milieu, the lack of a precise definition of a business model has led to assumed definitional comprehension across the literature and industry alike. In an academic context, it is astonishing that after reviewing 103 publications purporting to investigate business models, Zott et al. (2011) found 37% of authors did not define the concept at all while a further 44% offered only cursory definitions without meaningfully outlining business model components. Definitional consistency is a related issue; where a definition(s) is provided, a plethora of different, conflicting, and independent versions can be identified across the literature. The loose and inconsistent use of the term 'business model' has had the effect of isolating overall research effort and has impeded contingent theoretical development (Osterwalder 2004; Casadesus-Masanell & Ricart 2007; Hurt 2008; Zott et al., 2011; Casadesus-Masanell & Ricart 2011; Perkmann & Spicer 2013; Abraham 2013; Arend 2013; Massa et al., 2017). It is only very recently that an "increasingly uniform business model understanding" (Wirtz et al., 2016: p.38) has begun to surface that defines the

scope and purpose of the concept, although even here fundamental questions persist (Wirtz et al., 2016) and paradoxical tensions remain in its theoretical constitution (Klang et al., 2014).

From a practitioner's perspective, the lack of a single comprehensive and unambiguous business model definition has not curtailed wide and enthusiastic adoption of the concept. Afuah & Tucci (2002) point out that the phrase 'business model' has now found its way into the vocabulary of just about everyone in management or business. Similarly, Baden-Fuller & Morgan (2010: p.156) suggest that the business model concept is "profoundly important to the world of work". Ultimately, this has led to a situation where the term resides in our collective consciousness but means different things to different perceivers.

It is likely that broad adoption has been driven by practitioners simply responding to the term without considering its underlying theoretical constitution. The concept is possibly attractive because it provides a way for managers to navigate the "management theory jungle" (Koontz 1961; 1980) by virtue of its ambiguity. Most likely, business models are simply popular because they can be adapted to circumstance as required. Indeed, Baden-Fuller & Morgan (2010) have emphasised that business models can serve multiple valid purposes, ranging from descriptions of summarised role-models, to acting as recipes that can be copied and implemented. In this context, it is difficult for one definition to adequately encapsulate the innumerable potential applications for a business model. It is an even greater challenge when the concept itself continues to expand and evolve. For example, Perkmann & Spicer (2013) have asserted that a business model is actually a 'performance' by management analogous to a conductor orchestrating a musical

performance and Upward & Jones (2015) indicate a business model 'defines and achieves success'.

2.1.2 Defining the term business model

In order to meaningfully define the term 'business model', I have identified 62 different definitions from the wider literature on business models. Of these, 26 purport to be universally applicable to the concept and have been subsequently referenced on at least three occasions. Initially, these definitions appear independent and unrelated. Therefore, to identify similarities and interrelationships, I follow Morris et al. (2005) and Nenonen & Storbacka (2009) and assess operative words in each definition. From this assessment (Appendix 1), business model definitions increase in sophistication and comprehensiveness and consequently a number of discrete themes are evident. The definitional themes I identify are: *economic*, *value*, *interdependency*, *architecture*, and *integrated*. I classify my definitional themes as follows:

- **Economic theme:** represent definitions that focus on how the company makes revenue or profit.
- **Value theme:** represent definitions that focus on abstract views of how value is created (and captured) by firms.
- **Interdependencies theme:** represent definitions that highlight non-visible interdependencies that exist in an organisation and by implication must be exploited in order to be successful.
- **Architecture theme:** represent definitions that seek to describe the end-end structure of a firm related to its business model.

- **Integrated theme:** represent definitions that seek to synthesise the concept in its totality.

At a basic level, many definitions only codify a component of the firm such as its revenue model. In contrast, the integrated definitions I identify attempt to describe what the business model does much more broadly. These definitions address structural, methodological, and/or behavioural aspects of a firm and attempt to describe how a business model enables transactions to occur. Because operational business models necessarily require ongoing interactions between the firm and its external stakeholders, I focus on this definitional category further. Here, significant contributions were provided in the 1990s to early 2000s. This roughly corresponds with the increased popularity of the business model concept leading up to and during the so-called 'Internet boom'. More precisely, during this intense period of technological change a number of scholars sought to understand how e-business and technology influenced business models (and vice-versa). For example, assessing whether the (then new) phenomenon of electronic commerce was a potential threat to an existing incumbent firm or whether it was complementary, Timmers (1998: p.4) provided the following definition for a business model:

> An architecture for the product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues.

Taking a similar perspective, Slywotzky (1995: p.4) investigated how 'new' business models encouraged value migration away from 'out-dated' business models and offered the following as a holistic definition for a business model:

> The totality of how a company selects his/her customers defines and differentiates his/her offerings (or responses), defines the tasks it will perform his/herself and those it will outsource, configures his/her resources, goes to the markets, creates utility for customers and captures profits (Slywotzky, 1995).

After reviewing the origins of the business model concept, Zott et al. (2011: p.1028) indicate that the reason definitions provided by authors writing from a technology perspective are comprehensive, is that "in this stream of research a business model is not a value proposition, revenue model, or network of relationships by itself; it is all of these elements together".

Scholars from management and organisation studies were not quite as quick as those from e-business or practitioners themselves to recognise the holistic nature, or arguably, the importance of the business model concept. However, since the 2000s, management scholars have responded to the popularity of the concept and business models have been investigated in a number of different areas. In particular, research has focused on understanding the link between business models and value capture and/or firm performance, the system and/or network properties of business models, and business model innovation (Zott et al., 2011; Wirtz et al., 2016). To address the increased interest and potential research scope for the business model concept, definitions proposed by scholars were further increased in terms of the level of abstraction. For example, strategy scholars have defined business models as 'decisions' (Casadesus-Masanell & Heilbron, 2015), 'stories' (Magretta, 2002), and 'heuristics' (Chesbrough & Rosenbloom, 2002). To illustrate the high-level of

generality in proposed business model definitions I have listed four examples in Table 2.

Table 2: Examples of integrated business model definitions generated by management scholars

Integrated business model definition	Author(s)
A business model is a reflection of a firms' realised strategy.	Casadesus-Masanell, 2012
A business model is the logic and architecture of the economic and societal value creation and value capture system.	Rohrbeck, 2013
The business model describes the system of interdependent activities that are performed by the firm and by its partners and the mechanisms that link these activities to each other.	Zott & Amit, 2013
Decisions enforced by the authority of the firm.	Casadesus-Masanell & Heilbron, 2015

Practitioners also instinctively refer to the term 'business model' broadly and use the concept in a vast number of different ways. Definitions arising from industry are thus also typically all encompassing. For example, writing for Accenture and reviewing what makes a 'good' business model, Linder & Cantrell (2001: p.1) propose that a business model is the organisation's "core logic for creating value" a definition which sees the business model as housing the firm's dominant logic (Prahalad & Bettis, 1986). This perspective thus conceives the business models' logic as being all-encompassing and thereby aligns with more recent reports published by IBM. For example, in 2013 and in conjunction with the Australian National Institute of Economic and Industry Research, IBM defined a business model as follows:

> A business model describes how enterprises organise and apply their skills and resources (both internal and external) to deliver value to customers and citizens... we use the term broadly to capture both

> what organisations sell or provide and how they produce, deliver and market their products and services (IBM & National Institute of Economic and Industry Research, 2013: p.14).

Both these definitions acknowledge the purpose of a business model is to *create value*. This purpose is widely adopted in industry and scholarship alike. It is possibly best articulated in the definition provided by Osterwalder et al. (2010). A large community of influential firms – some of which I highlight in Figure 1 overleaf – and over 450,000 individual practitioners have adopted the tools and frameworks proposed by these authors to design new business models or 'renovate' old ones.[5] The following definition is therefore commonly used in industry:

> a business model describes the rationale of how an organisation creates, delivers, and captures value (Osterwalder et al., 2010: p.14).

[5] Based on number of registered users of www.bmcanvas.com

Figure 1: Firms adopting business model methodology proposed by Osterwalder et al. (2010)

Source: www.businessmodelgeneration.com/canvas/bmc.

However, no one single definition can adequately or meaningfully encapsulate the many legitimate ways business models are actually used *in practice*. Therefore, on balance, and even though George & Bock (2011) have concluded that the lack of a well-defined theoretical construct has led to inconsistent theoretical findings, it is better to have a more specific definition for a business model that accounts what it *is* to the person using or investigating it.

2.1.3 Business model definition adopted in this dissertation

Therefore, while the aforementioned definitions are valuable in their own right, they remain limited for my purposes. They are limited because they are either too abstract, or do not specifically incorporate a number of elements important for my research (which I highlight further below). To address these points, and as mentioned in my Introduction, I have adopted the following definition for my research:

> A business model is an open system that operates to create, deliver, and capture value over time for all stakeholders.

My definition is orientated around the concept of an open operating system. I have purposely included the concept of an open operating system to directly link with the inherent systems properties of business models outlined in the following section and to help specify what a business model *is*. In my case, a business model *is a system* that is active and interacting with its broader socioeconomic environment (inside and outside the firm's boundaries). Orientating my definition around an operating system is also important because my proposal for complex adaptive business models leverages the idea that business models are a type of system.

My definition also contains the specific purpose of *creating value* (Osterwalder, 2004; Osterwalder & Pigneur, 2010) which reflects the theoretical consensus regarding the purpose of business models (Wirtz et al., 2016). However, I have intentionally widened the purpose for value creation delivery and capture. Here, value may be include monetary or *non-monetary* aspects and must benefit *all* stakeholders rather than the firm and/or its customers alone. This extension aligns with Leih et al. (2015: p.28) who indicate a business model "must be enacted coherently in order to deliver value to customers, shareholders, and other stakeholders of the enterprise". My definition therefore closely aligns with *the behavioural theory of the firm* (Cyert & March, 1963) where the firm is conceived to be a participant in a coalition of related parties and must consider their ambitions as well as its own if it is to succeed.

Finally, I purposely include the dimension of *time* in my definition. Hedman & Kalling (2003) first identified time as an important variable for a business model. The authors highlight that for an operational business model to be complete a "longitudinal

process component is required to cover the dynamics of the business model over time" (p.53). I have also specifically included time in my definition because it is closely associated with the research priority of business model scholarship: to understand how "change and evolution" occurs in business models (Wirtz et al., 2016: p.38). Such change and evolution naturally requires a passage of time to occur.

My definition thus conceptualises business models as *continually operational* and therefore *dynamic* (Casadeus-Masanell & Ricart, 2011). I view a business model as a system open to the wider environment that continues to change over time in order to create value for everyone that engages with it. My definition therefore excludes the notion of a static business model valid only at a *point in time*. This means that related concepts such as a 'business model as a model' (Baden-Fuller & Morgan, 2010), 'business models as heuristic devices' (Chesbrough & Rosenbloom, 2002), or even the idea that 'business models are descriptions' (Osterwalder et al., 2010) are excluded. Further exclusions relate to the scope of the system my definition implies. For example, my definition acknowledges that a business model necessarily includes *multiple stakeholders* (either internal or external to the firm) and is the overall system that generates value for these stakeholders.

2.1.4 Characteristics of business models

Although embraced in varying degrees, business models exhibit a number of characteristics that apply universally to the concept. Specifically, these characteristics apply irrespective of whether a static or operative view on business models is taken or, indeed, whether business models are conceptualised in a *mainstream* or *evolutionary perspective*. Here, major characteristics of business

models have been identified in three significant streams of research: a *systems* stream, a *value* stream, and a *comprehension* stream.[6]

The *systems* stream focuses on exploring the characteristics of the *business model system* as it relates to the firm and the firms external environment (Afuah & Tucci, 2002; Seddon et al., 2004; Mayo & Brown, 2005; Chesbrough, 2007; Hurt, 2008; Zott & Amit, 2009; Wirtz et al., 2010; Zott et al., 2011; Rohrbeck et al., 2013; Afuah, 2015; Amit & Zott, 2015; Martins et al., 2015; Wirtz et al., 2016). Thus in their seminal work Afuah & Tucci (2002) identify that business models are a type of system comprised of three elements: components, links, and dynamics. The authors come to this conclusion by assessing technology firms in order to gauge the success of 'Internet business models' that they closely associate with operational systems. Notably, they provide a significant case study of Cisco that addresses how the firm goes to market, the strategies it employs, its market success, the profile of its customers, etc. Furthermore, as part of the case the authors highlight that "it is important to understand how one business model compares with another" (Afuah & Tucci, 2002: p.160) and the case study therefore also assess the business model employed by Cisco's largest competitor at the time, Juniper. Combined with results from similar case studies, Afuah & Tucci (2002: p.4) conclude that the "first determinate of firm performance is its business model" and assert that a business model is the overall system that enables this to occur.

Amit & Zott (2001) also identify that the firm's business model is *the* system that enables the firm's transactions to occur. However, instead of focusing on a few major cases to reach this conclusion the authors evaluate the performance of 58 e-

[6] In this section I do not analyse abstractions of business model theory including business model meta-models because they further obscure underlying theoretical concepts that I have used in Sections 2.2 and 2.3 to establish the *mainstream* and *evolutionary perspectives* on business models.

businesses that were ‘recently listed’. From their research, the authors also identify the rise of ‘virtual markets’ and the corresponding necessity for a business model system to span the firm’s boundaries in order to interact with the broader network or system. Hurt (2008) has extended the idea that a business model is a system interacting with a larger system to highlight that it is in fact ‘embedded’ in the larger system which informs its interactions. Hurt (2008: p.5) states that a business model “is part of a web linked to a larger web, as a system embedded in a super-system”. This interdependence is echoed by Zott & Amit (2009) who adopt Porter’s (1996) activity system concept to propose that a business model is itself an ‘activity system’. The authors propose that the business model, through the location of its activities, transcends the focal firm and spans its boundaries. In this view, the business model system enables activities to be either performed internally or externally to the firm and it follows that performance relies on the system operating effectively.

Business models can thus be conceived of as *systems* that incorporate all elements of the firm including those related to capabilities, resources, processes, partnerships, and human factors (Osterwalder, 2004; Santos, 2009). The components of the system are *interlinked* (Afuah & Tucci, 2002; Mansfield & Fourie, 2004), the system crosses firm boundaries (Amit & Zott, 2001; Hurt, 2008), and is embedded in a *broader network* or system (Rajala, 2012; Demil & Lecoq, 2010; Nenonen & Storbacka, 2009; Amit & Zott, 2001). Finally, the system is made up of *activities* that may or may not be performed by the firm itself (Zott & Amit, 2009).

The second major stream of research is focused on assessing *how* business models ‘create value’. In fact, according to Klang et al. (2014: p.13), “most contributions relate the business model concept to the notion of value” and the business model is

seen as a focal concept for value creation. In this large research area, there are two major sub-spaces. The largest by sheer publication number is focused on understanding how value can be created through *business model innovation* and was introduced by Chesbrough & Rosenbloom (2002) and Chesbrough (2007; 2010; 2013).[7] Commencing with a study of the success of spinoffs made by Xerox Corporation, the authors have continued to provide many other examples of how innovating a business model has significantly enhanced the amount of value captured by the firm. The actual performance of business model innovation *in practice* has also confirmed that purposeful business model innovation is a valid strategic option for a firm. For example, in 2006 IBM Global Business Services interviewed 765 corporate and public sector leaders from around the world on the subject of innovation. The results highlighted that:

> Companies whose operating margins have grown faster than their competitors' over the past five years were twice as likely as their lower performing peers to emphasize business model innovation (Pohle & Chapman, 2006: p.36).

Johnson et al. (2008) have further extended the idea that a business model should be innovated in a way that it may need to be totally reinvented when the external market changes. The authors illustrate their point by using examples such as TATA Corporation's development of the 'Nano' car and its cost advantage compared to alternative vehicles. Interestingly, this scenario was also contemplated in the above-mentioned IBM study. In fact, four out of ten executives interviewed in this study believed that a radical business model would totally change their industry. The

[7] Using Google Scholar the search 'business model innovation' and its derivatives returns 16,900 publications compared to 5090 publications for the search 'business model design' and its derivatives. Searches conducted 13 September 2016.

implication is that firms who have developed the capability to constantly innovate their business models will be better positioned to respond to external disruption.

The second major sub-space focuses on understanding how value can be created by a business model through its implicit design. The notion that business models can be intentionally designed or architected to achieve desired outcomes was initiated by Osterwalder et al. (2010) and Zott and Amit (2001; 2010; 2013; 2015) and I discuss the implications of adopting this approach in the following section on the *mainstream perspective* on business models. Alternatively, Mitchell & Coles (2004) indicate that business models can be used to *design* and then *test* business improvements and Nenonen & Storbacka (2009) suggest that for business models to be effective they must contain the *design principles* outlined in Table 3.

Table 3: Design principles applicable to a business model

Area	Design principles
Market	Market and customer definition
Offering	Offering design and earning logic
Operations	Operations design
Management	Management system

Source: Nenonen & Storbacka, 2009: p.50.

The third stream of research in business model scholarship has focused on the characteristics of business models that enable them to be *comprehended*. Business models have therefore been identified as *abstractions* (Seddon et al., 2004; Osterwalder et al., 2005; Teece, 2007) or *representations* (Al-Debei et al., 2011) of the business system; *viz.* they can be used to describe and understand what the organisation does, and how it does it. Business models are therefore often highly focused on comprehension through *narrative* (Magretta, 2002; Perkmann & Spicer, 2013), *modelling* (Baden-Fuller & Moran, 2010), *heuristics* (Chesbrough &

Rosenbloom, 2002; Loock & Hacklin, 2015), *external communication* (Sandberg, 2002), or *conceptualisation* (Osterwalder, 2004).

Finally, it is important to emphasise that a further characteristic of business models exists that does not neatly fit into the three streams of research I have briefly outlined. This characteristic is that business models are *not necessarily organisationally-exclusive* (Lund & Nielsen, 2014). For example, a firm may elect to join an industry-level business model such as, for example, an open alliance. While this is an inherent characteristic of the business model concept, only a limited number of firms are mature enough to engage with truly open business models (Chesbrough, 2006; 2012; 2013). This is possibly because a firm can find that not being in complete control of making changes to the business model can cause significant internal tensions inside and outside the firm.

2.1.5 Importance of 'fit' in business models

The possibility that a business model may become 'decoupled' from a firm highlights that the imperative for change that emanates from the external environment and which applies to business models, extends equally to the firm itself. In other words, change to the business model means change for the firm too. While I acknowledge this interdependency by assessing how business models change *in practice*, it has been somewhat overlooked by business model scholars with the notable exceptions of George & Bock (2011), Achtenhagen et al. (2013) and Ahokangas & Myllykoski (2014). This is possibly because business models have often been conceived in context of a typology (Malone et al., 2004; Baden-Fuller & Moran, 2010) or taxonomy (Timmers, 1998; Rappa, 2000; Groth & Nielsen, 2015). However, this raises the further questions: are business models that can be observed in the environment

actually good or even sustainable for the firm, even if they do align with company goals or create compelling value propositions? Should observable business models be imitated? Importantly, while many different business models have tenure in the marketplace, their existence does not mean they are appropriate for replication or adoption by another firm. Indeed, replicating an external business model may be very value-destructive. This can most dramatically be illustrated by the generic low-cost airline business model. While many business model scholars celebrate the success of low-cost airline business models, particularly that of Southwest Airlines (Casadesus-Masanell & Ricart, 2010; Markides, 2005; Santos et al., 2009; Sinfield et al., 2012; Teece, 2010; Smith & Tushman, 2010), there have been a significant number of low-cost airline failures. Button (2009) has identified at least 50 failures in Europe alone and argues that the low-cost model is a failed business model.

Similarly, over the last ten years business models have emerged which (for-profit) firms have struggled to replicate or implement. Open source software development in partnership with a multitude of contributing parties is one such business model. Indeed, collaborative open source software development can be considered a radical business model innovation (Bonaccorsi et al., 2006) because it has fundamentally broken sector norms and changed the economics of the entire software sector (Johnson et al., 2008). It is therefore clearly successful. Intriguingly, in this business model, the requirement for a financial return (for example to cover the cost of capital) does not exist. Participating collaborators seek no return other than an ongoing right to use the software which highlights that business models can operate independently of financial imperatives when necessary. In turn, this also indicates that business models can evolve beyond financial imperatives as their exclusive objective(s) and

highlights that the ‘value’ created by a business model may be multifaceted and include intangibles such as ‘utility’.

The implication of both examples is that while a business model may operate at a sector level, at the level of the firm it may be wholly inappropriate and at worst value-destructive. In essence, this relates to the concept of ‘fit’ (Sigglekow, 2002) between the particular firm, its business model, and its environment. In practice, this can be explained as the business model needing to be being aligned with the firm’s core logic, a view supported by Bucherer et al. (2012: p.183) who state “the business model has to fit a company’s long term strategy, corporate culture and core competencies”. However, because change is an ongoing process and the notion of a business model I have adopted requires value to be created over time, a better description is that business models must have *‘continuing dynamic fit’* with both the firm and the environment. In other words, both the firm and the business model must change in concert to properly respond to external environmental pressure over time. This notion aligns with Schneider & Spieth’s (2014: p.14-15) finding that “firms that innovate their business models must also entrepreneurially manage [i.e. change] their dynamic capabilities”. In Section 2.3 of this chapter, I use the necessity for a business model to maintain continuing dynamic fit with the firm and the external environment as a justification for my adoption of an *evolutionary perspective* in which to situate my own notion of a complex adaptive business model.

2.1.6 Business models and strategy

Given corporate strategy is widely regarded as a prime means by which change in the firm can be achieved, understanding the relationship between business models and strategy is important. Interestingly, this relationship is so close that there is

continuing debate about whether they are different or the same. This ongoing discussion remains unresolved (Klang et al., 2014; Massa et al., 2017), notwithstanding assertions to the contrary (Wirtz et al., 2016). On one side, Nielsen & Montemari (2012) believe that business models and strategy *are* different, arguing that a business model is the platform through which strategy can be executed. Casadesus-Masanell & Ricart (2010) similarly assert that all businesses have a business model but not all have a strategy. Their argument is orientated around the concept of 'core logic', asserting that a business model contains the firm's core logic and they separately define strategy as a plan to create competitive advantage. Afuah & Tucci (2002; 2015) disagree, arguing that a business model specifically enables the firm to achieve a competitive advantage and Morris et al. (2005) note that business models address (implicitly or explicitly) the internal competencies that underlie a firm's competitive advantage. McGrath (2010) highlights that the dynamism in business models can help a firm achieve a competitive advantage, although this may be temporary or transient.

Putting aside potential issues related to the intended purpose for business models which I explore further in subsequent chapters, one possible difference between strategy and business models is the approach employed to achieve the desired outcome(s). Mainstream strategy proponents have long focused on careful long-range planning (Drucker, 1954; Drucker, 1959; Porter, 1980; Porter, 1985; Porter, 1996) as the method of achieving a competitive advantage, while business models are typically seen as naturally dynamic and adaptive. In fact, the emergent properties of business models are directly relevant to the concept of complex adaptive systems, but are problematic for authors seeking a linear and predictable path for firms to achieve business goals. This possibly explains why many business model scholars

view business models as incomplete without a ‘directional’ or ‘controlling’ strategy component (Smith et al., 2010; Timmers, 1998; Seddon et al., 2004; Bucherer et al., 2012; Santos et al., 2012; Porter, 2001; Osterwalder & Pigneur, 2005; DaSilva & Trkman, 2014).

In actuality, the fact of having a strategic plan does not mean defined outcomes will be realised whether the business model is employed or alternatives are used. In practice, diversion occurs the moment a plan is conceived whatever the stated end-goal is. Mintzberg (1979) has long-recognised the diversion problem in strategy and argues for ‘emergent strategy’ defining it as a pattern of *ex-post* events. In this view, emergent strategy and a business model are equivalent and little difference in substance can be identified, even when the goal of achieving a competitive advantage is removed. Consistent with this interpretation, Chesbrough & Rosenbloom (2002) support the idea that a business model formulates the completive strategy through its operation, while Hurt (2008) suggests a business model should act as a ‘balanced scorecard’ to provide ongoing guidance to strategy. In both examples, a symbiotic relationship exists and similarities outweigh differences.

A further potential difference between business models and strategy is the treatment of competitors. Porter (1996) suggests that only strategy considers competitor positioning, a view supported by a limited number of business model scholars including Magretta (2002) and Seddon et al. (2004). This is a minority view that narrows the concept of business models. The majority, including Amit & Zott (2001), Chesbrough (2007), Teece (2007), and Hedman & Kaling (2003), believe business models are fundamentally outward-looking and consequently must consider

competitor activity. Johnson et al. (2008) extend an active view of business models and believe they should be specifically designed to interact with and consequently disrupt competitors' business models.

Essentially business models and strategy have become fundamentally intertwined in the sense that similarities far outweigh differences, particularly where an emergent view of strategy is adopted. However, in situations where strategy operates in a traditional mode to develop cognitively-active plans, small differences can be perceived, particularly as divergence to plan occurs. Ironically, in this scenario business models help to minimise divergence (Markides & Charitou, 2004) because they embody the organisation's core logic including its core purpose and original strategic intent. Interestingly, here strategy is seemingly absent but actually resident inside the business model. Thus, the concept of a business model can be considered synonymous with Porter's (2001: p.71) definition of strategy: "how all the elements of what a company does fit together" and this inexorable relationship enables business models to be associated with either mainstream or emergent strategy and therefore enables them to be conceived in a *mainstream* or *evolutionary perspective*. According to Massa et al. (2017) this duplicity enables business model theory to challenge assumptions on *how* value capture and value creation is achieved. In the following two sections I therefore outline the *mainstream* or *evolutionary perspectives* and discuss related assumptions on how value is created and captured according to each perspective.

2.2 The mainstream perspective on business models

2.2.1 Porter view of strategy

As mentioned, Peter Drucker and faculty members of the Harvard Business School

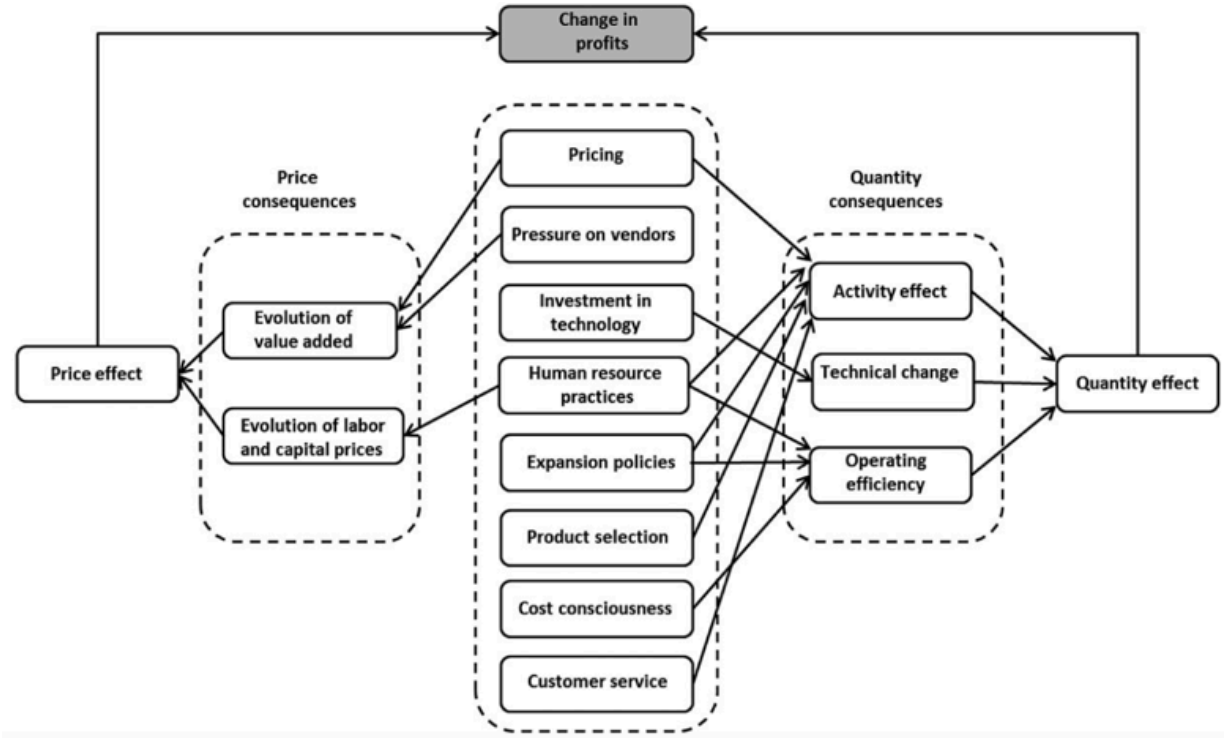
introduced the notion that the progression between formulating and implementing strategy is a rational process that can achieve intended outcomes (Snow & Hambrick, 1980). Often referred to as the 'Porter view of strategy', Porter's (1980) *Competitive Strategy* is the primary exemplar of this perspective. Porter asserts that five fixed sector-level forces exist (threat of new entrants, threat of substitutes, bargaining power of buyers, bargaining power of suppliers, industry rivalry) and that in this defined environment firms can *position themselves* by implementing a limited number of generic strategies (differentiation, cost leadership, and/or focus). The Porter view of strategy therefore encourages managers to make *bounded strategic decisions* and sets the expectation that when correctly implemented the firm will enjoy a period of protected coexistence with the external environment. In other words, the firm can position itself against its competitors in order to gain a *sustained competitive advantage*. Once achieved, the Porter view of strategy then emphasises actions a firm can take to create defensible positions against known competitive forces (Teece et al., 1997).

The *mainstream perspective* on business models follows the Porter view of strategy in the sense that (i) the environment in which business models operate is perceived as stable until some unknown exogenous shock occurs (Martins et al., 2015), (ii) the business model itself reflects rational managerial choices, and (iii) operating a business model will result in predetermined outcomes being achieved for the firm. Casadesus-Masanell & Ricart (2010) are leading proponents of this view, defining strategic decisions in the business model and their contingent outcomes as "concrete" (p.198). The authors also use the analogy of a machine to highlight how value creation is a linear process and business models operate with a predefined logic in order to generate a predefined outcome. To highlight the direct connection

between strategic choice and consequences, the authors summarise case studies on Ryanair and Telemore's entry into the Danish mobile phone market. In the case of Ryanair, Casadesus-Masanell & Ricart (2010) indicate that the strategic choice in its business model of a standardised fleet of 737 aeroplanes has the associated consequence of increasing the firm's bargaining power with its suppliers (notably, this consequence is directly equivalent to one of Porter's 5 forces and in my view may actually decrease the firm's bargaining power once the fleet is operational, due to the firm being 'locked-in'). In the case of Telemore, the authors indicate the strategic choice of 'low prices' has the consequence of generating new customers and thereby directly links transaction-cost economics with the case (Williamson, 1981) by implying the firm is somehow more efficient than its competition and can indeed offer a lower price-point to the marketplace profitably.

Casadesus-Masanell later collaborating with Brea-Solís et al. (2015) builds on these examples and provides a case study focused on Walmart. The authors seek to illustrate how decisions made in Walmart's business model, over a 36-year period, have directly impacted the firm's profit achievement. In Figure 2, I have reproduced a diagram from Brea-Solís et al. (2015) depicting the choices and consequences identified in Walmart's business model.

Figure 2: Walmart's business model



Source: Brea-Solis et al., 2015: p.16.

While the case study examples provided by Casadesus-Masanell & Ricart (2010) and Brea-Solís et al. (2015) make the connection between choice and outcome appear direct, they are oversimplified. Critically, the authors do not properly explore impactful external variables, such as concurrent competitor activity, the legislative and regulatory environment over time, or the impact of technological change. The latter is particularly important for firms located in the high-technology sector of the economy, such as Telemore. The examples also underestimate the difficulty in achieving firm-level outcomes, such as lowering a firm's cost base and ignore whether the achievement is greater or less than reductions achieved in similar, peer firms. Essentially the case studies match historically-known outcomes to a narrow range of potentially impacting variables and we cannot say whether the same

decisions made today would result in similar outcomes being achieved in the future. However, notwithstanding these limitations, the mechanistic linear analogy is often repeated in business model scholarship. For example, Sinfield et al. (2012: p.87) also conceive choices in business model design as switches and levers that can be "flipped one way or another", ostensibly at the will of the firm and necessarily with the assumption that stakeholders (such as customers) will accept any or all changes the firm desires to make.

The belief that a business model can be intentionally designed to fit a known external environment is extended by Zott and Amit (2001; 2010; 2013; 2015). In a series of primarily conceptual papers, the authors indicate that business model 'designers' need to consider the architecture of the business model (its content, structure and governance) and design it around specific themes of novelty, lock-in, complementarities, and efficiency (Zott & Amit, 2010) while simultaneously taking account of the firm's goals, its external environment, the sector's incumbent business models, and stakeholder activities (Amit & Zott, 2015). The authors thus build on their belief that a business model is a type of *structured template* (Amit & Zott, 2001) that helps the firm transact to propose that a business model can, and presumably should, be designed to determine what the firm does more broadly: "how the firm conducts business" (Zott & Amit, 2010: p.222). However, while the authors provide a more holistic system-level view of a business model and propose that the "purposeful weaving together of interdependent activities…is the essence of business model design" (p.218), their impression of a business model remains routed in the underlying notion that the inputs can be directly mapped to outcomes and that the external environment is stable. For example, in Zott & Amit (2015: p.343) the external environment is simply described as a "design constraint" that a business model

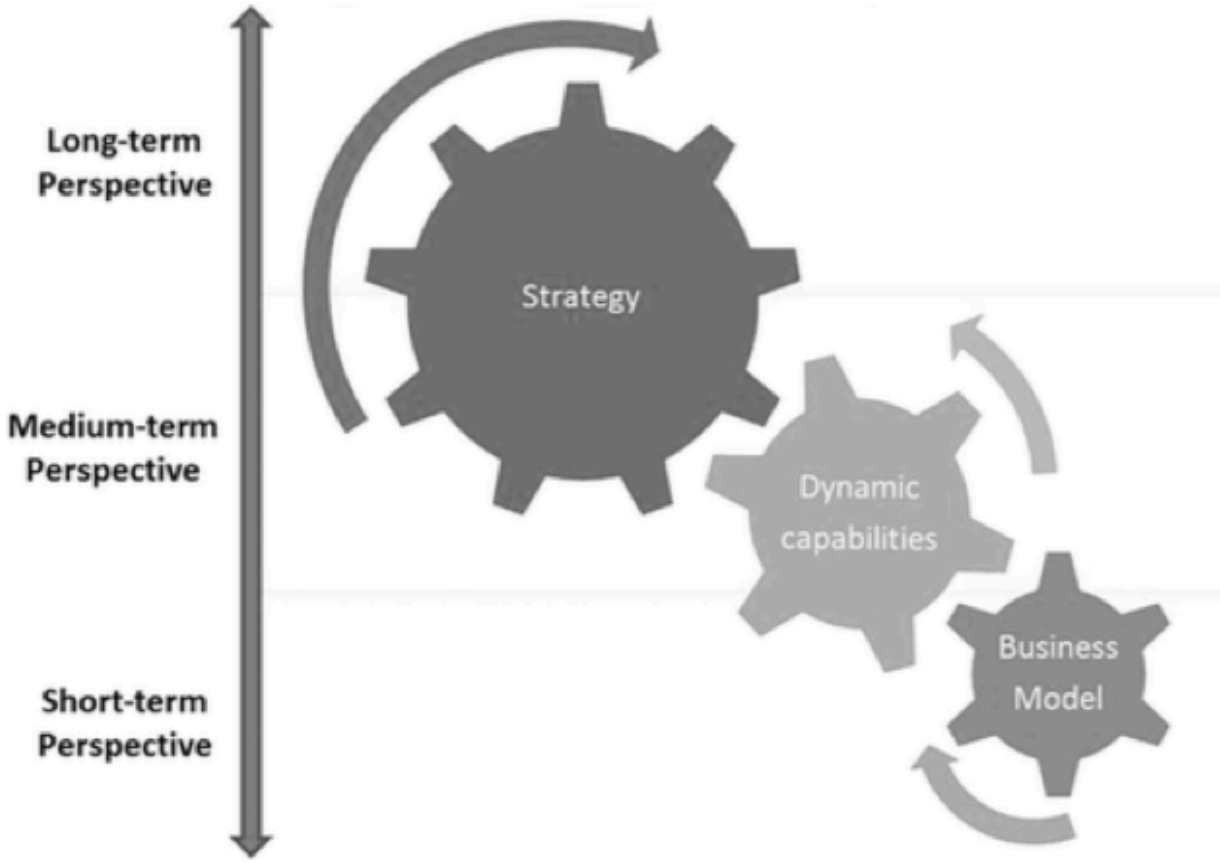
designer must work around; despite their own acknowledgement (contained in their proposal for future research) that a recursive design cycle may be required to respond to external environmental change.

In a related conceptual paper, Baden-Fuller & Moran (2010) extend the idea that a business model is a template prescribing how a firm does business, by asserting that a business model is a *model* that can be used to serve three fundamental purposes: (i) to act as a scale or role model allowing for classification in a taxonomy or typology; (ii) be used as a comparator for scientific enquiry, and (iii) function as a recipe: as a practical model for copying. Baden-Fuller & Mangematin (2015) develop the modelling concept further by suggesting that a business model is a *model* that can be used more broadly for 'strategizing'. However, with the notable exception of Waldner et al. (2015) who explore how industry factors moderate firms' propensity to innovate, the majority of examples that explain how business models 'emerge' actually explore how start-up firms reached their current form (for example, an interesting case is provided on Airbnb describing how its business model changed from the firm's inception). Therefore, by under-investigating how established operational business models evolve and by treating a business model akin to a 'scientific' model, the authors align (perhaps unintentionally) with Osterwalder (2004) and Osterwalder et al. (2010). These researchers provide the more detailed practitioner-orientated business model design frameworks I mentioned earlier. Significantly, the idea that a business model can be rationally planned by the firm, either by using modelling techniques or by way of using detailed tools or frameworks, remains linked to the underlying belief that a business model can be positioned in a known environment. It therefore remains linked to the Porter view of strategy, transaction-cost economics, and resource-based theory. For example, Osterwalder (2004: p.89-90) indicates that

the latter two attach to the business model canvas, particularly when the business model extends past the firm's boundaries and partnerships are required in a business model.

Unlike business models conceived in a static mode (for example, when being planned at a point in time), *operational* business models need to ensure a *continuing dynamic fit* with the environment and therefore must change as the environment changes. To analyse how this occurs, some business model scholars have extended resource-based theory by way of extension into dynamic capabilities (Teece et al., 1997). This positions dynamic capabilities as a mechanism that determines how business models change without modifying the aforementioned high-level notions attached to the concept. For example, re-summarising the Ryanair case study DaSilva & Trkman (2014: p.383) argue that strategy links with dynamic capabilities, which in turn, "constrains possible business models to face upcoming or existing contingencies". In other words, a firm's internal resources limit (or in the opposing view, enable) the capacity of the business model to change – see Figure 3. DaSilva & Trkman (2014) use this diagram to summarise their proposed interrelationship between strategy, dynamic capabilities, and the firm's business model.

Figure 3: Strategy, dynamic capabilities, and the business model



Source: DaSilva & Trkman, 2014: p.384.

This positioning is consistent with Casadesus-Masanell & Heilbron (2015) who assert that dynamic capabilities are a subset of a firm's internal resources and should be deployed to ensure superior returns. Schneider & Spieth (2014) likewise perceive a firm's dynamic capabilities as a simple extension of the firm's own internal resources. It is highly likely that this interpretation for the use of dynamic capabilities has followed the way Teece (2010) positioned the relationship between the concepts. Herein, Teece outlined that strategy, business models, and dynamic capabilities are directly linked. Teece further asserted that logical, sequential, and planned steps for achieving a sustainable competitive advantage should be followed. For example,

Teece (2010: p.182) outlined that four steps are needed to generate a "competitively sustainable business model" that achieves a *sustainable competitive advantage* and delivers *supernormal profits*. The steps are as follows; 1) firms should segment the market, 2) create a value proposition for each segment, 3) design and implement a mechanism to capture value from each segment, and 4) figure out and implement isolating mechanisms that block imitation by competitors. Teece (2010) also indicated that by following these steps new business models, or refinements of existing business models, would often result in *lower costs* and/or *higher returns* to the pioneer.

This interpretation for the use of dynamic capabilities in context of business models extends linkages between resource-based theory, transaction-cost economics, and key ideas advanced by the Porter view of strategy, such as the notion that rational planning should precede change to the business model (George & Bock, 2011). Interestingly, in 2015 Teece adjusted his guidance for how dynamic capabilities can be used in conjunction with business models. His new guidance provides a much more emergent view for their use, which has not yet filtered through mainstream business model scholarship.[8]

Business models have also been regularly associated with other tools and concepts advanced by the Porter view of strategy, primarily the value chain and activity system concepts (Porter, 1985; 1996). I have previously highlighted Zott & Amit's (2010; 2015) adoption of the activity system concept but neglected to mention the many authors who have associated business models with the value chain idea; these include Hedman & Kalling (2003); Sako (2012); Alt & Zimmerman (2001);

[8] I have summarised Teece's updated guidance in Section 2.3 of this chapter that describes the *evolutionary perspective* on business models.

Chesbrough (2007); Saebi & Foss (2015); Girota (2013); Baden-Fuller & Mangematin (2015); Frankenburger et al. (2013). However, except for Frankenburger et al. (2013) who provide a strong case study that diagrammatically maps the value chains for SAP, 3M Services, and Geberit, the association between the business model and value chain concepts seems to be a shorthand way of saying the firm has a process for creating value. However, this does not help increase understanding of the difference between the two concepts or how they potentially interrelate.

In summary, of the 39 theoretical antecedents potentially applicable to the business model concept provided in Appendix 2, the *mainstream perspective* adopts the Porter school of strategy in that it provides a positioning view for business models. This enables business models to be intentionally designed, planned, or modelled and then situated in a known environment in order to achieve intended strategic outcomes. Transaction-cost economics (Williamson, 1981), Porter's (1985; 1996) value chain and/or activity system concepts, and resource-based theory (Penrose, 1959; Wernerfelt, 1984; Barney et al., 2001) are thus incorporated. Further, the *mainstream perspective* adopts dynamic capabilities theory (Teece et al., 1997), but only when dynamic capabilities are conceived as a subset of the firm's internal resources. Ultimately, scholars adopting a *mainstream perspective* require a pre-existing strategy that directs changes to the business model. Taken together, Amit & Zott (2015: p.332) believe the business model concept has "rich theoretical roots" contradicting Teece's (2010: p.174) claim that "the concept of a business model has no established theoretical grounding in economics or in business studies".

2.2.2 Adopting a mainstream perspective

A *mainstream perspective* is adopted when a scholar or practitioner adopts the

notion of a business model with the intention of gaining a *sustainable competitive advantage* for the firm through its use. Mainstream strategy explicitly states this objective as its *sine qua non*. Although I have outlined that business models have a different explicit purpose – creating and capturing value (Osterwalder, 2004; Osterwalder et al., 2010) – in the *mainstream perspective*, the implicit purpose is that in creating and capturing value, the firm will achieve the goal of gaining and sustaining a competitive advantage over its rivals. Excluding Morris et al. (2005) who recognise this ambition in their definition, this implicit purpose is pervasive and is likely adopted by default when referring to a business model. The expectation is illustrated in this simple quotation:

> Business models play an important role in firms' ability to attain a sustainable competitive advantage (Gerasymenko et al., 2015: p.79).

Significantly, the expectation that through the business model the firm can (or will at some future point in time) achieve a sustainable competitive advantage has almost certainly been imbued inside a neoclassical economics paradigm. The neoclassical paradigm itself is, arguably, the dominant paradigm adopted in strategic management and is the paradigm on which Porter view of strategy is based. Through its ubiquity, it is the foundation of (or at the least, fundamentally informs) the theories attached to the mainstream business model concept. This lends credibility to my assertion that this is the default perspective taken when considering, or referring to, business models without definitional and/or theoretical consideration. However, as mentioned in the Introduction, this grounding is more appropriate for when business models are conceived in a *static* mode; for example as *heuristics* (Chesbrough & Rosenbloom, 2002), *models* (Baden-Fuller & Morgan, 2010), or *plans* (Osterwalder,

2004). This is because the *mainstream perspective* struggles to adequately explain how operational business models adapt, by themselves, in response to a constantly changing external environment punctured by regular exogenous shocks (Martins et al., 2015).

2.2.3 Problematizing the mainstream perspective

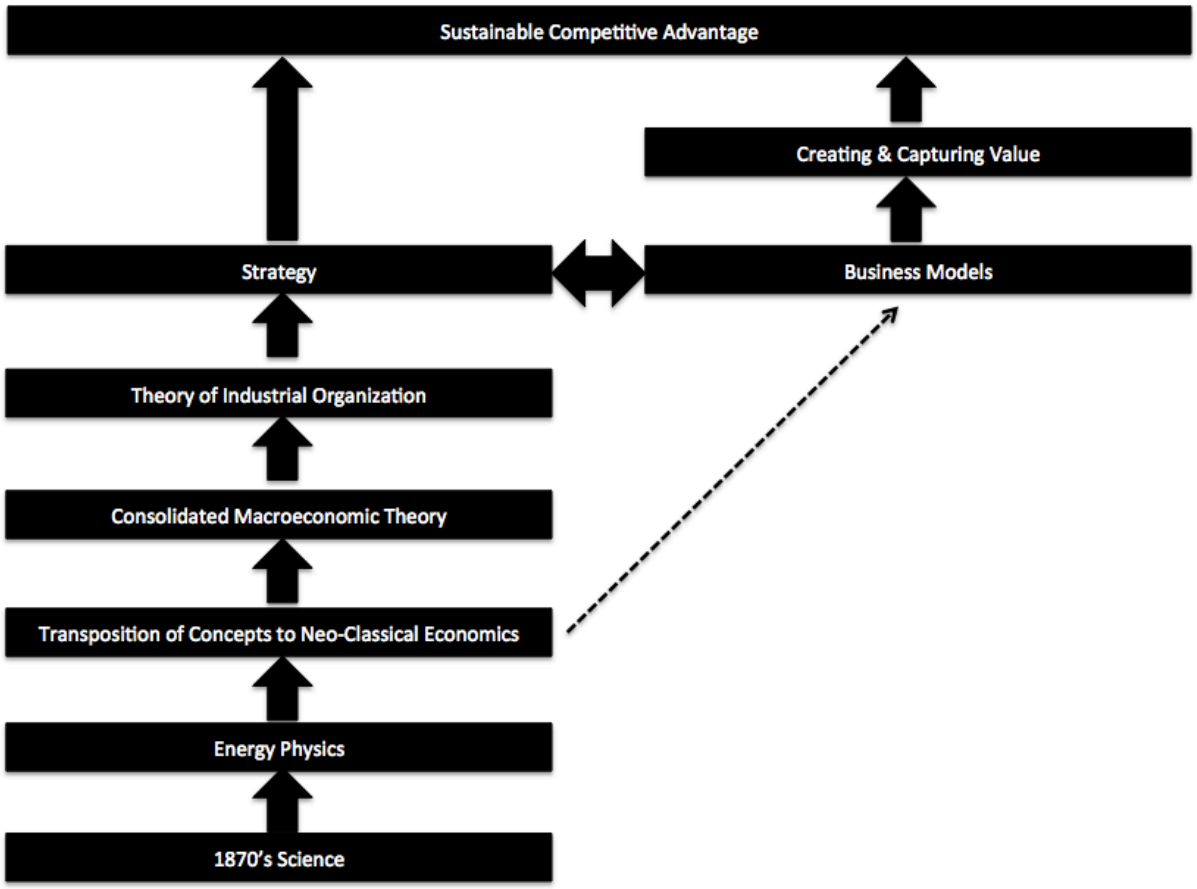
It is likely that a neoclassical grounding for business models is challenged to explain unexpected (i.e. non-linear or 'spontaneous') change to the business model because it sees value creation as a *supply side phenomenon* only (Massa et al., 2017) and change is treated as *mathematically predictable*. This is achieved by making several *critical assumptions* that have been *problematized* and ultimately *falsified* by a number of scholars. Due to the significance of these potential problems for mainstream business model theory, I provide a detailed assessment as follows:

In tracing the lineage of strategy, Beinhocker (1997) identified that the precursor to strategy itself – the theory of industrial organisation (Williamson, 1975; 1990) – is based on 19th Century neoclassical economics. Rumelt et al. (1994) confirmed that transaction cost economics is the foundation on which both Chandler (1962) and Williamson base their theories. In turn, both Chandler and Williamson were heavily influenced by earlier work on the firm by neoclassical economists like Coase (1937) and Taylor (1947). It is also notable that strategy's general popularity was significantly enhanced once Porter (1980) published the specific strategy techniques and tools mentioned, above, which are themselves based on neoclassical economics precepts.

The implications of this lineage are significant if we accept Beinhocker's (1997; 2006) assertion that neoclassical economic theory is based on an erroneous transposition

of concepts from 19th Century energy physics. In short, it potentially renders the neoclassical paradigm – on which both mainstream strategy and the *mainstream perspective* for business models are conceived – as compromised. The overall relationship Beinhocker establishes is diagrammatically represented in Figure 4, modified to highlight the position of business models in the hierarchy.

Figure 4: Underlying foundations of mainstream strategy and sustainable competitive advantage



Source: Beinhocker (1997) and Lichtenstein (2000a; 2000b) with business model additions by author.

The original relationship between 19th Century physics and its consequent adoption in the form of neoclassical economics is not obvious and very few scholars explicitly recognise the relationship. This is possibly because both scientific and economics language obscures the connection, but it is more likely that the neoclassical paradigm has become so pervasive that its relevance is simply accepted. Indeed it has taken major events like the global financial crisis for economists to publicly acknowledge that existing neoclassical economic models have significant limitations (Greenspan, 2009; Krugman, 2009; Romer, 2016).

To support his contention, Beinhocker identifies Irving Fisher's 1892 PhD dissertation that transposed a physicist's 'particle' with an 'individual'; 'force' with 'marginal utility', and 'kinetic energy' with 'total expenditure' (Beinhocker 1997: p.26). At the level of visible transpositions, Mirowski (1989; 1991) also identified a series of similar transpositions of 19th Century scientific language into economic concepts, and considered this wholesale adoption of physics into economics as "scandalous" (Mirowski, 1989: p.3). Ormerod (1997) has also identified the same transpositions of science into economics as the root cause of modern economics' problems. He goes even further, stating that economics was "hijacked" (Ormerod, 1997: p.9) by the 19th Century physical sciences. In addition, Nadeau (2008; 2010; 2013) has traced various correspondences from the period to identify errors in both concept and application. Nadeau also made the simple observation that leading neoclassical economists of the time (Jevons, Walras, Edgeworth, and Pareto) were all trained as engineers before turning to economics, which implies a predisposition towards incorporating physical science into economic theory.

Finally, and lending further credibility to Beinhocker's claim through detailed scrutiny, Smith & Foley (2007) have identified that Fisher (1892) not only transported the principles into economics language but incorrectly mixed metaphors from thermodynamics and mechanics in his work. Finally, taking a tangentially similar approach, theoretical physicist Lee Smolin has recently compared mathematical models used by modern economists and physicists and found striking similarities between the two disciplines (Smolin, 2013).

Not only did neoclassical economists adopt a language from science, but entire principles were "shipped wholesale from nineteen century mechanics and operationalized through set-theoretic foundations" (Potts, 2010: p.278). In particular, economists adopted two critical assumptions ultimately embedded in Alfred Marshall's (1920) seminal *Principles of Economics*: (i) that the economy is a *closed system* and (ii) the general theory of *equilibrium*. In turn, these neoclassical concepts have informed strategy's core purpose: the assumption that firms can reach a point of *sustainable competitive advantage*. Together, these key three assumptions as applicable to strategy and business models are discussed in further detail below:

i. The economy is a closed system:

Neoclassical economists assume the entire economic system is *closed* (Arthur, 1993; Boulding, 1993; Nadeau, 2010; Georgescu-Roegen, 1996; Mahoney, 2005) and only the forces of production and consumption can interplay. Therefore, in the economic system, profit represents system energy: without energy (profit) the system declines; with energy, the system (economy) grows. Profit maximisation has therefore become economics' first principle (Edgeworth, 1881: p.317).

Further assumptions allow the closed system to be mathematically represented. First, resources required for production were assumed to be *external* to the system and *inexhaustible*. Second, the concept of *externalities* was used to remove any external influence to the economic system. Finally, *isolations* were used to theoretically remove elements from the influence (of other elements) to enable their modelling, consideration, or calculation (Maki, 1992).

Mainstream strategy and thus the *mainstream perspective* of business models has subsequently incorporated a 'closed-system' paradigm through adoption of neoclassical economics' principles. The closed-system perspective in particular has become consistent with how we conceptualise modern organisations. Supporting this contention, Miller (1993) concludes that organisations (and also business models) are predominantly viewed as closed and trending towards their own internal equilibrium.

ii. The theory of general equilibrium:

Building on a closed system paradigm, the concept of general equilibrium is also borrowed from 1890s physics (Prigogine, 1984; Beinhocker, 2006; Lichtenstein et al., 2006; Arthur, 2013). Conveniently building on Adam's Smith's concept of an 'invisible hand' (Smith, 1989) and the principle of 'Pareto Efficiency', general equilibrium transposes the concept of closed-system and thermodynamic equilibrium into the broader economy. General equilibrium in this context seeks to explain how submarkets with differing demand and supply characteristics eventually all come to equilibrium and the economy will be in balance. Thermodynamic equilibrium itself relates to a branch of energy physics that has investigated what happens when a

closed system reaches a point where its constituent parts no longer change when they interact.

The error in this transposition is that economists only considered the *first* law of thermodynamic equilibrium and ignored the *second* (Ayres, 1998; Beinhocker, 1997; Liening, 2013). The second law of thermodynamic equilibrium suggests that in open (or isolated) systems, energy will move towards *entropy*. Entropy in this context is a move from order to a vast range of possible *new orders*. This is the opposite of what economists intend in the general theory of equilibrium and is actually more representative of the real economy when considered through an open system paradigm.

Importantly, while it is true that economists have developed a mathematical proof for general equilibrium (Walras, 1954), it requires input into a model of *false assumptions*, the most obvious being the assumptions of actors having perfect information and partaking in perfectly rational economic decision-making (Mills, 1874). Rational decision-making has been comprehensively criticised and falsified (Kahneman & Tversky, 1979; Kahneman et al., 1982; Tversky & Kahneman, 1986; Kahneman & Tversky, 2000; Thaler, 1985).

iii. Sustainable competitive advantage:

Both Lichtenstein (2000a; 2000b) and Casadesus-Masanell & Heilbron (2015) have identified the additional link between the principle of general equilibrium (which relies on a closed-system paradigm), and strategy's predominant purpose: achieving a *sustainable competitive advantage*. In particular, Lichtenstein (2000a; 2000b) emphasises that while organisations have traditionally been seen as stable (and able to exist in a state of equilibrium), they are actually inherently unstable when viewed

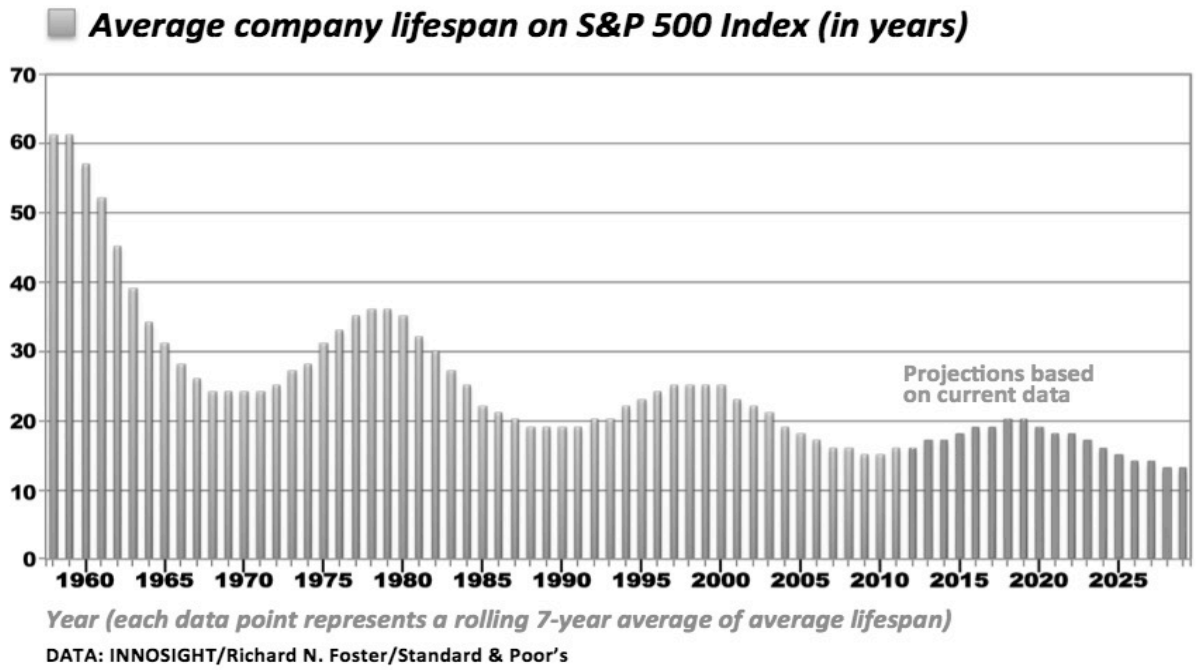
through an open systems' paradigm. This helps explain why sustainable competitive advantage has been *transient* at best for firms, as demonstrated by McGrath (2010; 2013) in her call to end the focus in strategy on attempting to achieve it. After reviewing 200 studies of organisational endurance and failure, Stubbart & Knight (2006) *empirically support* McGrath's contention concluding that "this [sustainable competitive advantage] theoretical ideal is on a collision course with the empirical record" (p.96).

2.2.4 Implications for the mainstream perspective

Using false assumptions in an economic model or strategic approach has been comprehensively criticised by mathematician Henri Poincaré (1874). Poincaré reminded original neoclassical economists, transporting scientific principles into economic theory, that any conclusions based on false assumptions are not 'false' but rather are "without interest" (p.304). The modern equivalent of this is 'garbage in, garbage out'. This is important because it highlights that the *evolutionary perspective* may be a more appropriate location to conceptualise certain business models, for example, operational business models. This is because tensions between neoclassical principles (such as attempting to achieve a sustainable competitive advantage) and the reality of an unstable economic environment, is leading to increasing organisational failure even when a firm follows a neoclassical prescription for success (Christensen, 1997). Declining organisational success can be seen on many levels, but a useful proxy measure is provided by the average tenure firms have on the US 'Standard & Poor's 500' which has been significantly diminishing over time. Since a peak of a 62-year average in 1960, firms today only can expect to remain listed for 18 years. It is estimated that by 2030, the average tenure will further

decrease to 12 years (Foster & Innosight, 2012: p.1) – Figure 5 below illustrates previous and expected decline in company lifespans.

Figure 5: Average company lifespan on the Standard & Poor's 500 index



Source: Foster & Innosight Inc., 2012: p.1.

At this juncture, it is worth noting that Milton Friedman would contend that the problems in assumptions are irrelevant; what matters is whether the outcome is sufficiently good for the purpose of prediction (Friedman, 1966). In response, meta-studies on organisational survival and endurance such as those conducted by Stubbart & Knight (2006) or Hagel et al.'s (2010) study of all US-listed firms from 1965-2010, demonstrate a collapse in competitive advantage and ever-decreasing shareholder returns. Accordingly, I now turn to outlining the *evolutionary perspective* on business models where I locate my notion of a complex adaptive business model and justify my empirical research.

2.3 The evolutionary perspective on business models

2.3.1 Emergent view of strategy

In contrast to the *mainstream perspective* on business models, an alternative but less mature theoretical grounding is provided in emergent strategy (Mintzberg, 1979; 1987; 1994; Eisenhardt & Sull, 2001; 2012; 2015; McGrath 2010; 2013) and in evolutionary economics (Nelson & Winter, 1982). Consequently, scholars adopting an *evolutionary perspective* do not assume the wider economic and social environment for a business model is stable and that fixed long-term plans will be successful. Instead, a regularly disrupted environment (Christenson, 1997; Johnson et al., 2008; Christensen & Johnson, 2010; Kagermann et al., 2011) is anticipated. While the perspective itself is still emerging, to coexist in such an environment, the business model is expected to remain in a constant state of change. This change is not perceived as linear and easily predictable. Rather, it is conceived as an ongoing series of short-term actions and/or decisions followed by an ongoing series of subsequent adjustments.

The idea that a stream of actions (Mintzberg, 1987) in a business model can precipitate ongoing system level change, is likely to be based on the positioning for strategy itself as provided by Eisenhardt & Sull (2001; 2012). The authors assert that strategy itself can be conceived as a series of “simple rules” that, when followed, enable strategic (but potentially unpredictable) outcomes for the firm to be achieved over time. Of particular relevance to this dissertation, Eisenhardt & Sull (2001: p.108) assert that the concept is especially relevant for the “new economy” (i.e. the high-technology sector) and highlight Cisco as a prime exemplar of a firm that displays the presence of rules in its ongoing decision-making. Taking a similar perspective,

McGrath (2010; 2013) highlights that a fast-changing environment requires a firm's strategy to be equally fast-moving and that any competitive advantage a firm might capture will only be *temporary or transient*. Instead McGrath (2013: p. 40) indicates a firm must be continually reconfigured in an "evolutionary manner" to reinvent itself as circumstances change. These concepts have been directly applied to business models. For example, Sull (2015) discusses how simple rules apply in the context of business models and in her paper titled 'Business Models: a Discovery Driven Approach', McGrath indicates that:

> In highly uncertain, complex and fast-moving environments, strategies are about insight, rapid experimentation and evolutionary learning as much as the traditional skills of planning and rock-ribbed execution (McGrath, 2010: p.247).

McGrath further emphasises that in fast-changing environments traditional measures of strategic planning success are "nonsensical" (McGrath, 2010: p.258) because if everyone is able to predict the future, no advantage (to anyone) would be gained from the insight. However, while Johnson et al. (2008); McDonald (2013; 2014), McDonald & Eisenhardt (2014), and McGrath (2010; 2013) provide key theoretical support for the *evolutionary perspective* on business models, some similar criticisms I have made above *apropos* the *mainstream perspective* also apply. In particular, in my view these authors oversimplify the many potentially impacting variables that may precipitate [business model] change. The key examples provided, where a business model has successfully adapted, are usually focused on start-up firms or alternatively on firms facing an existential crisis. Notwithstanding this, scholars adopting an *evolutionary perspective* embrace the underlying notions that speed of environmental

change necessitates a matching cadence of actions and/or decisions in a business model that cannot be predetermined long in advance. This idea is articulated in a number of different ways, but most frequently, it is simply described as business model 'experimentation' (e.g. Brunswicker et al., 2013; Martins et al., 2015; Guo et al., 2015; Wrigley & Straker, 2016) or 'trial and error' (e.g. Chesbrough, 2010; Sosna et al., 2010; Laudien & Daxböck, 2016). This notion can be neatly summarised as follows:

> Business model innovation [i.e. change] is not a matter of superior foresight ex ante – rather it requires significant trial and error, and quite a bit of adaptation ex post (Chesbrough, 2010: p.356).

Chesbrough (2010) builds on Eisenhardt & Sull (2001) and McGrath (2010) to propose that in rapidly-changing environments, significant value can be gained by a firm *proactively* adapting its business model. He asserts that this can be achieved through 'business model innovation' (2002; 2007; 2010) via 'open business models' (Chesbrough, 2006; 2007; 2012; 2013a; 2013b). In fact, as early as 2002, Chesbrough recognised business model innovation was a peer to product and/or service innovation in terms of potential value creation. Chesbrough thus identified it was under-exploited and proposed it should be used and exploited as a pathway for future firm growth. To achieve business model innovation Chesbrough (2012: p.22) recasts the analogy of a stream of actions and proposes a business model captures value through a "series of activities", which he asserts should be regularly changed in concert with the firm's external stakeholders. Critically, Chesbrough (2007: p.5) also identifies a typology for business models that identifies business models by their

maturity level, which he names the “business model framework”. I have summarised these business model framework types in Table 4.

Table 4: Summary of business model frameworks

Type	Description
1. Undifferentiated	Commodity business model. Competes on price and availability only.
2. Differentiated	Some degree of differentiation. Targets customers other than those that buy simply on price and availability.
3. Segmented	Competes in different segments simultaneously. The price sensitive segment provides the volume base for high volume, low cost production. The performance segment supplies high margins for the business.
4. Externally aware	Open to external ideas and technologies. Unlocks a significantly greater set of resources available to the company.
5. Integrated	Integrated with innovation process. Business model plays a key integrative role within the company.
6. Adaptive platform	More open and adaptive model than types 4 or 5. Ability to adapt requires a commitment to experimentation with one or more business model variants.

Source: Chesbrough, 2007.

Among business model frameworks, Chesbrough (2007) considers the lowest maturity business models as commodity-related and undifferentiated, which can only compete on price and availability. While the highest maturity for a business model is for it to act as an “adaptive platform” (Chesbrough, 2007: p.15) for the firm. While Chesbrough does not jettison some concepts I would more closely associate with the *mainstream perspective*, it is clear from his recommendation that business models should be improved to move up the maturity hierarchy outlined in Table 4. In other words, a business model should be fundamentally opened to a firm’s partners, suppliers, and customers and that value will be gained through the process of co-creation and experimentation. In this way, he leverages resources inside and outside the firm’s boundaries and moves his grounding for business models away from the

resource-based theory of the firm and towards an *ecosystem view* where value is created within an overall network of activities (Schumpeter, 1936). Further aligning with Eisenhardt & Sull (2001; 2012) and McGrath (2010; 2013), Chesbrough (2012) emphasises the imperative for a firm to operate high maturity business models if they are to offset the trends of shorter product life cycles and continually increasing development costs, which are known to be exceptionally severe in high-technology sectors.

Chesbrough (2007; 2010; 2012) justifies his assertions with reference to both start-up firms and large firms that have long established and operational business models. For example, he identifies that even behemoths such as IBM, Intel, or Procter & Gamble do not have sufficient internal resources to counter the speed, and cost of responding to, change in their environments. However, a significant limitation of Chesbrough's research which equally applies to McGrath (2010; 2012), McDonald (2013; 2014); and McDonald & McDonald & Eisenhardt (2014), is that it relies on active direction from senior management, to apply changes to the business model. For a multitude of different reasons, such direction will not be provided in many firms, particularly those that are operating profitably. Chesbrough describes this challenge in the following way:

> Successful business models can create inertia as well, making it harder for very successful firms to respond appropriately to changes in their environment (Chesbrough, 2013: p.77).

In contrast, my proposal for complex adaptive business models adopts Chesbrough's recommendation for constant experimentation in the business model, but does not require senior management to sponsor change. Consequently, I closely align with

Sosna et al. (2010) who also adopt an *evolutionary perspective* and assess how a business model adapts in response to external stimulus. While not focused on the high-technology sector, the authors provide an interesting in-depth case study focused on Naturhouse, a Spanish dietary products business. The authors explain that the firm's business model has been historically successful but is threatened by an economic recession. They indicate that to navigate a changing environment where the status quo is threatened, instead of big strategic changes, "constant revision, adaption, and fine-tuning" (Sosna et al., 2010: p.385) of business activity is required. Critically, the authors situate their findings in the organisational learning literature and highlight the applicability of Nelson & Winter's (1982) evolutionary economics thesis. They indicate that the process of trial and error is the key enabler of overall change to the business model; they also specifically emphasise Nelson & Winter's assertion that organisations "remember by doing" (Sosna et al. 2010: p.386). Therefore, while limited by being focused on a single firm, the authors demonstrate that external change necessitates matching change in the business model and show that such change is best achieved through constant activity. Through further detailed qualitative case study research, Laudien & Daxböck (2016: p.4) similarly identify that 'business model innovation' is an emergent process which is "usually not a process initiated top down, but [is] rather a learning process" that seeks to respond to external pressure(s) to innovate. Indeed, after investigating 10 'average market players' the authors conclude that *before* deliberate business model innovation can occur, at least one "emergent process round" (p.8) must be completed. Ultimately, this finding implies that even the purposeful business model innovation that I associate with the *mainstream perspective* is conducted in a larger emergent context.

Smith et al. (2010) focus on the implications that arise when an *evolutionary perspective* on business models is adopted. The authors suggest that a firm that houses a 'complex business model' must not only be able to manage, but should encourage strategic tension and paradox. This ability is a critical factor that provides maximum scope for business model innovation. It has a direct relationship with the notion of the edge of chaos (Stacey, 1992) in complexity science, as well as the management of complexity that I further discuss in Section 2.3.6. Using data gained from 132 in-depth interviews with senior managers across 12 firms, Smith et al. (2010) assert that, in contrast to making change to the business model itself, it is up to a firm's leadership to encourage an environment where tension and strategic paradox can occur. Clearly this is easier said than done. Simple inertia, organisational politics, and other barriers mean the vast majority of existing firms will not proactively ensure an acceptable organisational environment exists. The authors thus provide a prescription for how firms can encourage constant change to their business models, but not a pathway that can be easily followed for a firm to actually do so.

Here, Achtenhagen et al. (2013) propose that the use of a firm's dynamic capabilities in an evolutionary mode provides the way for a firm to react to their external environments for a sustained period of time. Teece, collaborating with Leih et al. (2015), supports this contention by recasting his earlier advice to business model scholars (summarised earlier) emphasising that:

> For practical purposes dynamic capabilities can be decomposed into the three sets of activities, namely sensing opportunities, seizing

them, and transforming the organisation to do so (Leih et al., 2015: p.38).

Teece and his colleagues also highlight that dynamic capabilities should work in conjunction with a firm's strategy to respond to a high stakes challenge (i.e. the changing environment). He does not mention the ambition of gaining a sustainable competitive advantage or the ability to gain supernormal profit. Instead the authors note that dynamic capabilities used in this context contribute to the firm's evolutionary fitness and *assist its ability to survive longer term*. This is a very different outcome for business models, a point which I leverage below.

2.3.2 Adopting an evolutionary perspective

Scholars adopting an *evolutionary perspective* therefore intentionally seek to avoid potential drawbacks of associating business models with the Porter view of strategy, neoclassical economics, or resource-based theory including its extension into dynamic capabilities as outlined by Teece (2010). Instead, authors who adopt an *evolutionary perspective* accept that value creation and capture is moved into the broader ecosystem in which the business model operates and therefore both *supply and demand* side (Massa et al., 2017) considerations apply. This means accepting that any advantage to the firm or value captured by the business model may be *temporary* (McGrath, 2010; 2013) rather than permanent as external pressures the firm cannot control exert influence. Instead, the *evolutionary perspective* implies that long-term organisational *survival* instead of gaining a sustainable competitive advantage may be a more *appropriate strategic ambition* (Sosna et al., 2010).

Consequently, the *evolutionary perspective* is likely to be a more appropriate frame in which to theoretically locate operational business models for the key reason that

externally-driven change stimulus is constant and therefore an operational business model must be sufficiently flexible and adaptable in order to respond to it over time. This is particularly relevant to the high-technology sector that is known to be highly complex and rapidly changing (Kagermann et al., 2011; McGrath, 2010) and regularly punctured by significant disruption (Christenson, 1997). This seemingly chaotic environment thus provides a particularly powerful ongoing change imperative. In turn, this requires business models in the sector to *change constantly* to ensure they maintain a *continuous dynamic fit* with the firm and the external environment by responding to the conditions they face (Martins et al., 2015).

However, while I conceptualise business models in an *evolutionary perspective*, it too contains some existing weaknesses. In particular, while constant external change and ongoing business model experimentation is expected, such change often requires *senior management intervention*. This expectation is a particular characteristic of research on business model innovation. Furthermore, many variables that precipitate business model change are unknown (McGrath, 2010) and therefore it is challenging to determine *how* change to the business model actually occurs unless identifiable through visible initiatives such as intentional re-design or prototyping (Brunswicker et al., 2013) – a situation I do not address in my research. Finally, cases that focus on successful business model adaptations tend to address start-up firms or firms in crisis. To address these weaknesses and to understand *how* an operational business model natively adapts, *by itself*, without specific senior management intervention, I extend the *evolutionary perspective* on business models into complexity science and propose that business models function analogously to complex adaptive systems.

2.3.3 Extending the evolutionary perspective into complexity science

Interestingly, the originators of the business model concept introduced change imperatives for business models that have been somewhat overlooked by modern scholars, but remain relevant today. Consistent with the most fundamental characteristic of business models, Jones (1960: p.619) asserted that it is critical for firms to manage "a whole system of business" and further emphasised that the system itself must be attenuated to change because it is part of a larger economic machine. Jones then elucidated that members of the system must keep running to simply stay in place (p.620).

Not only do these concepts align with the *evolutionary perspective* I have described above, but they also seem to have anticipated recent developments in management theory based on the complexity sciences. For example, Jones' former point is itself analogous to a complex adaptive system (the firm) operating inside a larger complex adaptive system (the economy). His latter point is similarly analogous to the 'red-queen effect' (Van Valen, 1973; 1974) which emanates from evolutionary biology and which has been adopted by management scholars using complexity science principles (Pascale et al., 2000; Eisenhardt & Sull, 2001; 2012; Voelpel et al., 2005; Cruz, 2006; Pina e Cunha & Vieira da Cunha, 2006; Beinhocker, 1997; 2006).

2.3.4 Complexity science

Complexity science itself (Kauffman, 1990; Holland, 1986; Gleick, 2008; Stacey, 1995; 1996a; 1996b; 2007; Griffin et al., 1998; Waldrop, 1993; Arthur, 1996; 1997; Arthur et al., 1997) can be simply described as "two's company, three's a crowd" (Johnson, 2009: p.12). Ultimately, it is interested in understanding the phenomena that emerge from a collection of empowered decision-making agents interacting

inside a system (Johnson, 2009). It is also the study of simple cause and complex effect (Phelan, 2001) and, in this regard, complexity science opposes the general scientific approach of 'top down' reduction and explanation that has been clearly deified by the study of emergent patterns (Brownlee, 2007). Instead, complexity science theorises that simple rules govern complex outcomes, which are attained through the principle mechanisms of feedback and emergence (Phelan, 2001).

In an interesting coincidence, the roots of complexity science lie with the mathematics of chaos theory (Gleick, 2008) as originally studied by Poincaré in the 1880s. This is the same mathematician that critiqued the closed system assumption(s) introduced into the foundations of neoclassical economics as highlighted the previous section of this chapter. However, according to Fuller & Moran (2001) complexity science is specifically not the study of chaos (which is a result of entropy), nor is it the study of randomness. Complexity science is interested in the patterns of order, self-organisation or emergence, under the conditions of constrained diversity (Wilden & Hammer, 2001). Over time, complexity science has itself emerged to incorporate findings from many disciplines but it is built on the predominant theoretical antecedents I outline in Table 5.

Table 5: Antecedent theory of complexity science

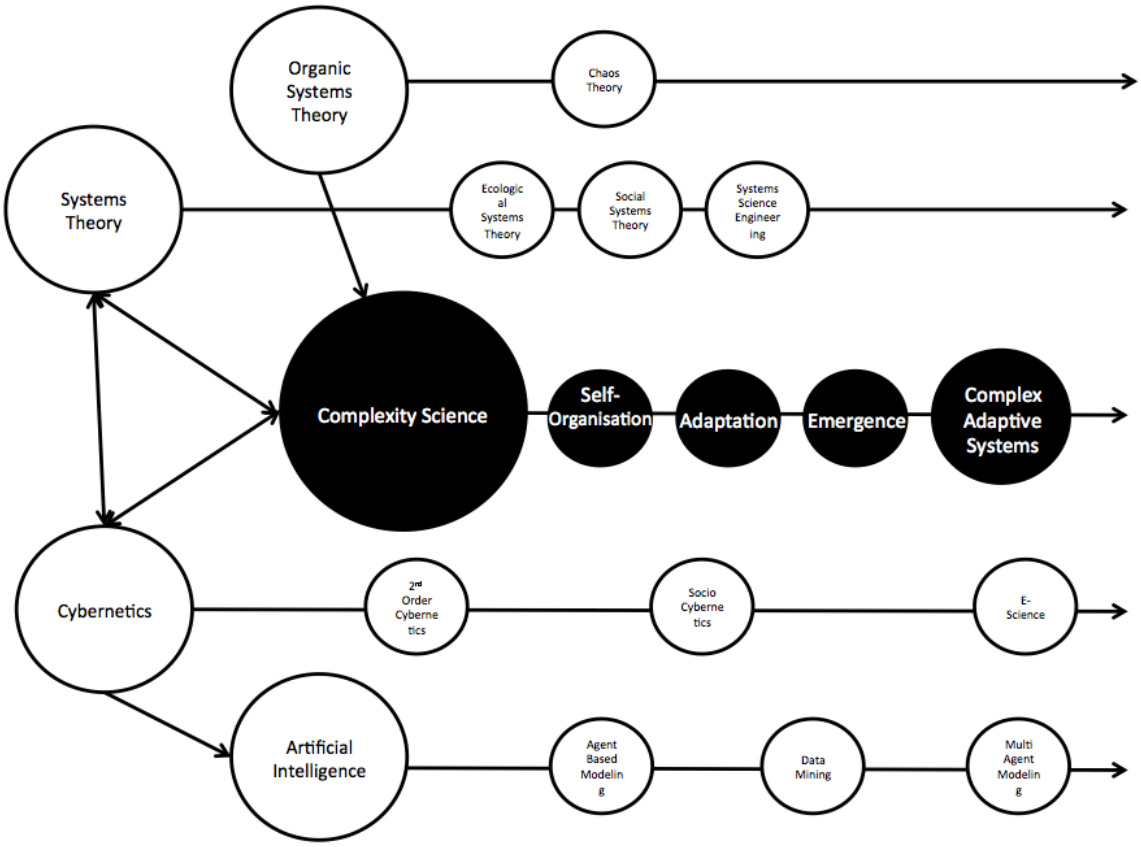
Theory	Author
Cybernetics	Weiner, 1948; 1961
System dynamics	Forrester, 1961; Maruyama, 1963
Computational genetic algorithms	Von Neumann, 1966
Self-organization	Prigogine& Glansdorff, 1971
Deterministic chaos theory	Zeeman, 1977
Synrgetics	Haken, 1977
Autopoiesis	Maturana & Varela, 1971
Fractals	Mandelbrot, 1963
Chaos theory	Poincaré, 1880; Glieck, 2008

Source: Lichtenstein, 2000a; 2000b; and other authors.

2.3.5 Complexity science in the social sciences

Castellani & Hafferty (2009) have expanded complexity science deeply into the social sciences. Taking a broader view of complexity, they include several modern sociological findings in their interpretation of complexity science. They include findings related to the 'new network science' of 'small worlds' (Milgram, 1967; Watts, 1999), the concept of 'six degrees of separation' (Watts, 2004) and the 'power' of the 'power law' (Bak & Chen, 1991). The latter is able to indicate when a cascading change (Gleick, 1987) will reverberate through a scale-free network (Barabasi & Frangos, 2002), with the discovery of 'the strength of weak (social) ties' (Granovetter, 1973). Castellani & Hafferty's (2009) contribution is useful because sociology-based inclusions move the discipline closer to an integrated whole. Figure 6 outlines the overall development of complexity science.

Figure 6: Summary of the development of complexity science



Source: based on Castellani & Hafferty, 2009; with author's contributions.

Complexity science has also been extended into economics in an attempt to overcome identified shortcomings of neoclassical economic models and assumptions. Specifically following a ten-day long dialogue held between eminent scientists from the natural sciences and economists in 1987 hosted by the Sante Fe Institute in the USA, joint declarations were made that specifically located economics in complexity science. Importantly a consensus emerged that the economy was neither a closed system nor trending towards equilibrium (Arthur et al., 1997; Waldrop, 1993). Instead, participants agreed that agents (individuals and/or firms etc.) exhibit spontaneous behaviour and are not purely rational.

Participants also tentatively proposed that the economy exhibits a number of characteristics that are similar to those seen in an 'evolving complex system' (Anderson & Arrow, 1988). An evolving complex system has the same characteristics as a complex adaptive system (Holland, 1975; Holland, 1992; Holland, 1986; Levin, 1998; Stacey, 1996a; Cowan et al., 1999; Morowitz, 1995; Kauffman, 1993; Kauffman, 1990; Gell-Mann, 1995) and, over time, the term 'complex adaptive system' has supplanted the original. For simplicity, a complex adaptive system in context of economics can be described as a "system that is in a process that constantly evolves and unfolds over time" (Arthur, 1999: p.107).

The specificity of the economy being considered a complex adaptive system is significant because complexity science itself is *pre-paradigmatic* (Kuhn, 1962) and a narrower interpretation allows for tighter testing and refinement. In addition, many areas in complexity science relate more particularly to biological organisms, which are not socially aware (Miller & Page, 2007) in a human context. The specificity that an economy is a complex adaptive system also enables capture of key dynamic elements of system and/or network theory, such as considering the economy as an evolving network (Kirman, 1997). It is also consistent with precepts from evolutionary economics (Veblen, 1898; Nelson & Winter, 1982; 2002; Silva & Teixeira, 2009; Potts, 2000) thus building on, and not stranding, key contributory economics findings and continuing the link with the *evolutionary perspective* on business models. Finally, it is also useful because original assertions from the complexity sciences were that the economy exhibited characteristics of chaos theory (complete randomness). These original assertions have in all likelihood led to popularisation of the term 'chaos economics' or 'butterfly economics' (Ormerod, 1999), which is possibly due to

a misunderstanding on the differentiation made between chaos and complexity outlined previously.

In any event, the 1987 Santa Fe Institute declaration that an economy exhibits characteristics of a complex adaptive system, was largely speculative (Blume & Durlauf, 2005). Since then, 25 years of research has been completed into whether the economy does indeed resemble a complex adaptive system (e.g. Arthur, 1989; 1994; 1996; 2013; Foster, 2000; Beinhocker, 2006; Gintis, 2006; Levin, 1998; Holland, 2013). While it cannot be 'proven' that an economy *is* a complex adaptive system, the contention has *not been falsified* either and, more importantly, the utility of the proposition has grown.

2.3.6 Characteristics of complex adaptive systems

In order to understand the implications of viewing economies, organisations, and – potentially – business models as complex adaptive systems, it is important to understand the characteristics of complex adaptive systems in detail. Characteristics of complex adaptive systems fall into two broad categories and, in combination, enable the system to evolve to a new state. The two categories are listed and then outlined below:

Category i: agents, decisions and interactions

Category ii: feedback, adaptation, and emergence

i. Agents, decisions and interactions

Complex adaptive systems are made up of *intelligent agents* (Fuller & Moran, 2001) that self-determine within the boundaries and rules of the system. Agent's *decisions* and consequential *interactions* determine the *dynamics* of the system. Agents only have access to a limited, local information-set on which to base their decisions and thus perceive the system (Ramalingam et al., 1988) rather than comprehend it. This leads to agents attempting to 'guess' what other agents will do (Johnson, 2009) in their decision process. Moreover, decisions made by agents set *path dependency* in which early choices determine future possibilities (Miller & Page, 2007). Some agents may also be socially aware (e.g. individuals; firms) and their learning can also lead to cooperation or competition between agents (Miller & Page, 2007). Alternatively, socially aware agents may copy other agents' strategies (Axelrod & Cohen, 2000). Agents are able to operate in networks, but are not tied to them and their *interactions may cross network boundaries* inside the overall system. Agents believe they operate autonomously but they are fundamentally interdependent (Fuller, 2001). Through their decisions, agents in a complex adaptive system interact causing complex non-linear dynamics (Brownlee, 2007). Interactions can be between individual agents, groups of agents, the complex adaptive system itself, or with the external environment. Ultimately agents' interactions lead to feedback and emergence (Rottner, 1999).

ii. Feedback and emergence

Two defining characteristics of a complex adaptive system are the capacity for *feedback* and *emergence*. Emergence is precipitated by decisions, interactions, and feedback between agents. Feedback can be *negative* or *positive*; negative feedback ensures the system moves towards a predictable equilibrium state, while positive

feedback amplifies change along an unpredictable equilibrium path. In combination this leads to "paradoxical states of stability and instability" (Stacey, 1995: p.487). However, while both negative and positive feedback simultaneously exist, it is recognised that positive feedback is a "defining property of complex systems" (Arthur, 2013: p.12) because its presence enables the system to exhibit explosive behaviour rather than to simply decline.

Adaptation, as a reaction to feedback and as a micro pattern (Holland, 1975) in a complex adaptive system, has been shown to lead to a greater form of emergence particularly when populations of agents reach a critical balance point: the edge of chaos (Stacey, 1992) or self-organising criticality (Bak, 1996).[9] At this point, the space for truly novel behaviour is maximised because an optimal level dynamic tension has been reached (Brown & Eisenhardt, 1998; Anderson, 1999) and consequently there are a greater range of options that are available for selection in order for such novelty to occur (McCarthy et al., 2006).

Emergence is what leads to complexity (Holland, 1996) which, in turn, leads to the establishment of new coherent structures in a complex adaptive system and ultimately coevolution of the system itself (Holland, 2000; Holland, 2006). Emergence is what keeps the system from reaching equilibrium but also defies total system chaos [disorder] and instead leads the system to self-organise. Emergence has both positive and negative consequences. One negative consequence of emergence is unintended consequences and therefore, other than setting optimal system rules, managing emergence is difficult (Stacey, 1996; Beinhocker, 1997; Sargut & McGrath,

[9] The terms are used interchangeably but have slightly different characteristics when used in differing contexts.

2011) because emergent behaviour is not attributable to any single component (Waldrop, 1993).

The aforementioned characteristics of complex adaptive systems ultimately lead the system to construct a new state that is, by its nature, applicable to all agents inside the system. This is seen as *spontaneous self-organisation* because no single entity enables the change to occur and it is often perceived as a system shock or chaos. This is very much the principal outcome of the previously conveyed characteristics of a complex adaptive system.

2.3.7 Organisations as complex adaptive systems

Kauffman (1995) has proposed that a corporation is 'living' in a similar sense to a biological organism. He asserts that "the modern corporation is a collectively self-sustaining structure… that 'lives' in an economic world… and survives or dies in ways at least loosely analogous to those of E. Coli" (p.300). While organisations do exhibit some biological traits, I believe organisations and business models, similar to the economy, are best described as complex adaptive systems. This specificity is necessary for two important reasons. First, complex adaptive system theory supports socially dynamic entities; and second, complex adaptive systems themselves can be biologically living or simulated; for example, complex adaptive systems have been identified in computers (Casti, 1997). Supporting my proposal, Bettis & Hitt (1995) similarly assert that firms are complex systems operating in a dynamic competitive environment. Fuller & Moran (2001: p.50) also assert that firms are complex adaptive systems operating inside the economic system. They state that "in effect each enterprise is itself a complex adaptive system … operating as an agent inside a larger complex adaptive system". Finally, Potgieter et al. (2005: p.1) propose that

firms are “complex adaptive enterprises” driven by complex behaviours and relationship interactions.

Not only have scholars argued that traditional firms are a form of complex adaptive system, various other non-traditional organisational types have also been investigated to determine if they operate as complex adaptive systems. In a particularly interesting study, Faucher et al. (2008) investigated Wikipedia and concluded it is a socially dynamic complex adaptive system. This study is significant because Wikipedia is orientated around a non-traditional business model that I would describe as complex and adaptive. For example, Wikipedia exhibits many management implications that flow from conceptualising firms as a form of complex adaptive system (for example, a very flat management structure and empowerment of its contributors through rules). In a similar vein, the management of the Internet has also been investigated and defined as a complex adaptive system (Vixie, 2007) and in a landmark study, the United States Institute of Medicine (2001) recognised healthcare as a complex adaptive system. Finally, Kesavarz et al. (2010) have studied schools and have proposed that they too are a form of complex adaptive system.

An alternative approach to studying complex adaptive systems at the level of firm has been to identify specific characteristics of complex adaptive systems in organisations. With this approach, Holland (2006) has identified that all firms are hierarchal irrespective of their formal structures. Similarly, Waldrop (1993) finds that a ‘business complex adaptive system’ displays hierarchical organisation and emergent behaviour not attributable to any single component. In related studies, Lichtenstein (2000a; 2000b) highlights complex adaptive system characteristics of emergence and co-

evolution in organisations. Alternatively, Beinhocker (1997), Stacey (1996), and Pascale et al. (2000) focus on the concept of the 'edge of chaos' in systems theory and its role for firms seeking to evolve or be strategically managed.

However, possibly the most compelling argument that firms are a form of complex adaptive system, was first recognised and proposed by Brian Arthur (1989; 1994; 1996). Arthur identified that firms can enjoy *increasing returns* (i.e. positive feedback) as opposed to *diminishing returns*, a fundamental principle of neoclassical economics. Arthur's key contribution was to confirm that increasing returns are not just theoretically possible, but are commonly achieved by firms in the high-technology sectors of the economy. In essence, Arthur pointed out that instead of reverting to equilibrium, some products (and services) increase their leadership position through network effects, customer adoption, and select barriers to entry. Today this can be witnessed, for example, in the phenomenal and increasing success of Google's search and operating systems' businesses respectively. Increasing returns, as a concept, are analogous to network effects (Kurtzman, 1998) and imply multiple equilibria are possible by way of feedback. Increasing returns also imply that path dependence (Marshall, 2005) significantly alters future outcomes. Ultimately, the concept of increasing returns, applicable at the level of the firm, represents the mechanism of feedback in a complex adaptive system.

Stacey (1996) has also proposed that firms are complex adaptive systems. However, Stacey (2001, 2007) later changed his view to propose that organisations are 'complex responsive processes', analogous to, but not exactly the same as, complex adaptive systems. The change predominantly relates to viewing firms as primarily social constructions rather than strictly systems. Critically, I have followed Stacy's

view and similarly structured my research question to acknowledge that business models may function *analogously* to, but not precisely equivalent to complex adaptive systems.

2.4 Summary

Business models originated in the 1960s and include a mix of neoclassical and evolutionary antecedent theory that enabled two alternative theoretical groundings for business models to develop: the *mainstream perspective* based on mainstream strategy and neoclassical economics and the *evolutionary perspective* based on emergent strategy and evolutionary economics. A primary difference between these two perspectives relates to the treatment of change in the economic system. In the *mainstream perspective* it is possible to represent change mathematically, based on a number of assumptions. Change thus becomes a 'known known' and plans can be devised to take advantage of this foresight. In the *evolutionary perspective*, change is treated as a 'constant unknown'. In turn, a business model is required to maintain a *continuous dynamic fit* with the environment by changing as the environment changes. In Table 6, I provide a comparison between the two perspectives highlighting high-level differences between the two. In Table 7, I highlight the primary theoretical support for each perspective.

Table 6: High-level comparison of *mainstream* and *evolutionary perspectives* on business models

Mainstream Perspective on Business Models	Evolutionary Perspective on Business Models
Known stable environment	Regularly disrupted environment
Position business model in known environment	Business model in continual process of change
Long-term outlook	Short-term outlook
Strategic planning / plans precede change to the business model	Ongoing strategic decisions as environment changes
Sustainable competitive advantage	Continuous dynamic fit with environment / organisational survival over time

Source: based on author's assessment of various sources.

Table 7: Primary theoretical support for the *mainstream* and *evolutionary perspectives* on business models

Mainstream Perspective on Business Models	Evolutionary Perspective on Business Models
Neoclassical economics paradigm	Evolutionary economics paradigm
Transaction cost economics (Williamson, 1981)	Evolutionary economics (Nelson & Winter, 1982)
Dynamic capabilities (Teece et al., 1997)	Dynamic capabilities (Teece et al., 1997; Leih et al., 2015)
Resource-based theory (Penrose, 1959; Wernerfelt, 1984; Barney et al., 2001)	Value creation in networks (Schumpeter, 1936)
Management science / Long range planning (Drucker, 1954; 1959)	Stream of actions (Mintzberg, 1987); Strategy as simple rules (Eisenhardt & Sull, 2001; 2012)

Source: based on author's assessment of various sources.

For my purposes, I have established that economies and firms can be considered complex adaptive systems. This forms the basis for my proposal to extend the *evolutionary perspective* into complexity science and supports my contention that certain ***operational business models function analogously to complex adaptive systems*** as well. Importantly, viewing business models as functionally analogous to complex adaptive systems provides one potential way of describing *how* operational

business models change continuously, without the necessity for senior management intervention or a precipitating crisis.

3 COMPLEX ADAPTIVE BUSINESS MODELS

In this short chapter I outline why certain business models can function analogously to a complex adaptive system and in Section 3.2 I provide the link between the business model theory discussed in Chapter 2 and my own research. First, I contrast characteristics of both business models and complex adaptive systems to identify important high-level similarities between the two. I then provide a more detailed assessment and identify six characteristics that must be evident in a business model for it to be considered a 'complex adaptive business model'. Following this I demonstrate that, irrespective of the presence of some (or all) of these characteristics, if a business model is tightly constrained through its governing conditions and/or operating environment it will not be able to operate with sufficient flexibility to resemble a complex adaptive system. I therefore include business models in this category and emphasise that traditional economic sectors are unable to support a complex adaptive business model. Correspondingly, I show that the high-technology sector *is* potentially able to facilitate the operation of a complex adaptive business model, because firms operating in this sector have demonstrated the ability to generate 'increasing returns' – a form of positive feedback in an economic system (Arthur, 1996).

3.1 Why business models are analogous to complex adaptive systems

The basis of my proposal that business models in the high-technology sector function analogously to complex adaptive systems is my observation that operational business models, whether conceived in a *mainstream* or *evolutionary perspective, a priori* exhibit characteristics of a complex adaptive system. For example, a business model:

- Is a type of system.
- Incorporates a large number of agents (stakeholders involved with the business model).
- Includes different types of agents (individuals, competitors, firms, etc.).
- Spans the firm's boundaries.
- Is inherently more flexible than the firm itself.
- Accepts and responds to feedback from its environment.
- Has capacity to adapt, adjust and/or change.
- Has capacity to coevolve with its environment.
- Exhibits emergent behaviour.

However, notwithstanding the above list, business models may simply be considered functionally analogous to a complex adaptive system because they include a large number of decision-making stakeholders interacting in an economic system. This interaction results in a continuing bidirectional flow of information that resembles the mechanism of feedback in a complex adaptive system. For example, a complex adaptive business model naturally accepts feedback, whether positive or negative, and provides feedback into the broader system. Feedback *from* the system is by way of received sales, complaints, user suggestions, competitor positioning, market price-points, market share, etc. Feedback *to* the system is by way of price-setting, product features, marketing collateral, product or service development or extension, sales calls, industry talks, etc.

3.2 Expected characteristics of complex adaptive business models

To identify more specific characteristics of complex adaptive business models against which *I have aligned my supporting research questions*, I have firstly

contrasted characteristics of operational business models (whether conceived in the *mainstream* or *evolutionary perspective*) against characteristics of complex adaptive systems themselves in detail. From this comparison, I extrapolate associated expected characteristics of complex adaptive business models (this assessment can be found in Figure 7, overleaf). However, this is a very simple extrapolation based on my own observations and assessment. I therefore further buttress my initial assessment using Arthur et al.'s (1997) descriptions of six critical characteristics of the economy as a complex adaptive system. Finally, and informed by each prior assessment, I document a final list of expected complex adaptive business model characteristics.

Figure 7: Extrapolated characteristics of complex adaptive business models

Business model characteristics	Complex adaptive systems characteristics	Expected complex adaptive business model characteristics
Type of economic system	**Open** system	**Open** system operating inside a larger open system (the economy)
Business model contains for the firm's **strategy** (refer: Section 2.1.6 for further details)	System governed by rules and restrained by **boundaries**	Governed by **rules** and restrained by **boundaries**
Interlinked stakeholders inside and outside the firm	Multiple types of **interacting agents**	Multiple types of **interacting agents** inside and outside the firm
Firm makes majority of decisions	Empowered agents make **decisions**	Agents are empowered to make decisions
Delayed & **limited feedback**	Continual **feedback** both **positive** and **negative**	Continual **feedback** both **positive** and **negative**
Firm **manages** development of business model	**Non-linear** emergence	**Non-linear** development of the business model
Business model innovation can open **new growth paths**	Agents' decisions set **path dependency**	Multiple **possible growth paths** available but development subject to path dependency
Creates and captures **value for the firm**	Agent decisions based on limited information and **perception**	Creates and captures **value but** value perceived by agents
Can **change** either regularly or infrequently based on environmental change & governing conditions.	Assumes environmental **disequilibrium** and changes constantly	Assumes environmental **disequilibrium** and changes constantly
Unexpected outcomes **occasionally** occur	Unexpected outcomes **regularly** occur	Unexpected outcomes **regularly** occur

Source: author.

As a further assessment, I map extrapolated complex adaptive business model characteristics identified in Figure 7 to Arthur et al.'s (1997) characteristics of an economy-wide complex adaptive system. Whilst there are a number of scholars providing detailed descriptions of complex adaptive system in the social sciences, I have invoked Arthur et al. (1997) because their descriptions are crisp and couched in 'economic' rather than 'scientific' language that best matches my requirements. More importantly, the paper's authors, Brian Arthur, Steven Durlauf, and David Lane are all formative scholars in complexity economics; they are arguably best placed to relate characteristics of a complex adaptive system to an *'economic complex adaptive system'* such as a business model. My secondary assessment is provided in Table 8 on the following page.

Table 8: Mapping of complex adaptive business model characteristics to the economy as a complex adaptive system

Characteristic	Description	Mapping of expected complex adaptive business model characteristics
Dispersed interaction	What happens in the economy is determined by the interaction of many dispersed, possibly heterogeneous, agents acting in parallel. The action of any given agent depends on the anticipated actions of a limited number of other agents and on the aggregate state these agents co-create	• Multiple types of **interacting agents** inside and outside the firm. • Value **perceived by agents.**
No global controller	No global entity controls interactions. Instead, controls are provided by mechanisms of competition and coordination between agents. Economic actions are mediated by legal institutions, assigned roles, and shifting associations. Nor is there a universal competitor—a single agent that can exploit all opportunities in the economy.	• Agents are **empowered to make decisions**. • Governed by **rules.** • Restrained by **boundaries.**
Cross-cutting Hierarchical Organisation	The economy has many levels of organization and interaction. Units at any given level—behaviours, actions, strategies, products—typically serve as 'building blocks' for constructing units at the next higher level. The overall organization is more than hierarchical, with many sorts of tangling interactions (associations, channels of communication) across levels.	• **Open economic system** operating inside a larger economic system (e.g. economy).
Continual Adaptation	Behaviours, actions, strategies, and products are revised continually as the individual agents accumulate experience—the system constantly adapts.	• Continual **feedback** both positive and negative. • Continual **adaption of business model**.
Perpetual Novelty	Niches are continually created by new markets, new technologies, new behaviours, new institutions. The very act of filling a niche may provide new niches. The result is ongoing, perpetual novelty.	• **Non-linear** development within boundaries of business model. • **Creates value** • Multiple **possible growth paths** available but development subject to **path dependency** • **Perpetual novelty (i.e. survival)**
Out-of-Equilibrium Dynamics	Because new niches, new potentials, new possibilities, are continually created, the economy operates far from any optimum or global equilibrium. Improvements are always possible and indeed occur regularly.	• Assumes **environmental disequilibrium**: business model **changes constantly**. • Unexpected outcomes **regularly** occur.

Source: Arthur et al., 1997; author's mapping.

The mapping in Table 8 indicates that my initial extrapolated characteristics for complex adaptive business models are broadly consistent, although the category 'adaptation' required review and adjustment. Taken together, the two assessments above enable a final set of expected characteristics of complex adaptive business model to be developed. In Table 9 I thus provide the list of expected characteristics that *must* be observable in a complex adaptive business aligned to my supporting research questions. In Table 10 I also provide five further characteristics of a complex adaptive business model, which are also expected but *may not be* directly or easily observable. For example, path dependency as a characteristic of a complex adaptive business model is likely to occur but is also likely to be challenging to identify. In Appendix 3 I provide an extended assessment of these characteristics.

Table 9: Expected characteristics of a complex adaptive business model aligned to supporting research questions

Expected characteristic	Description	Supporting research question
Rules	The business model is governed by rules.	What rules and guidelines are identifiable in the business model?
Boundaries	The business model operates within defined boundaries.	What boundaries are identifiable in the business model?
Agents	The business model empowers participants to make decisions.	How does the business model empower its participants to make decisions?
Feedback	The business model exhibits both positive and negative feedback.	How does the business model exhibit positive and negative feedback?
Adaptation	The business model changes continually.	How does the business model achieve continuous change?
Emergence	The business model changes in unplanned or unexpected ways.	How does the business model change in unplanned and unexpected ways?

Table 10: Further characteristics of a complex adaptive business model

Further characteristic	Description
Open	The business model is an open system interacting in a series of larger systems (e.g. the economy).
Perceived value	The business model generates value which his perceived by its participants differently.
Growth paths and path dependency	The business model has multiple growth options that can close over time.
Disequilibrium	The business model changes constantly.
Perpetual Novelty	The business model (and the firm) survive over time.

3.3 Refining which business models may be complex and adaptive

Clearly not all business models operating in the broader economy have governing conditions that enable or facilitate any (or all) of the characteristics of a complex adaptive system outlined in Table 9 and Table 10. In particular, many business models operate under conditions of significant restriction that override their ability to process environmental feedback and/or adapt and evolve in response to it. Below I list the business models that operate under such conditions. In making these exclusions, I emphasise that many of characteristics of a complex adaptive system may remain present in the business model, but will be dormant. Nevertheless, an exclusion is appropriate because where a business model is unable to develop reasonably freely it will simply not operate in the way a complex adaptive system would operate. The business models unable to function analogously to a complex adaptive system include:

- *Undifferentiated*, *differentiated*, or *segmented* business models (type 1-3 business models according to Chesbrough's (2012) business model framework that I provide in Section 2.3.1 of Chapter 2).

- Business models that are *tightly guided and managed* (on a day to day basis) by a firm's executive and/or by its corporate strategy (e.g. through its approval processes, delegations, or other controlling artefacts).
- Business models in the process of being *actively modified* by the firm as a major project (e.g. through the process of executive-led business model innovation).
- Business models deeply embedded in an overriding *cultural dynamic*. For example, this excludes the most common business models operating in a Japanese domestic context.
- Business models deeply embedded in an overriding *religious dynamic*. For example, this excludes many Islamic business models.
- Business models deeply embedded in a *governmental dynamic*. For example, this excludes business models operated by government agencies and/or quasi-governmental businesses such as Temasek Holdings (Singapore government investment agency).
- Business models r*estricted by tight regulation or governmental oversight*. For example, this excludes some business models operated by banks and other financial agencies.
- Business models that operate to *generate subsistence returns*. For example, business models employed by non-government organisations.
- *Not for profit* business models or business models with a specific social remit.

Furthermore, in addition to the exclusions listed above, static or new business models (including business models associated with start-up companies) are also excluded from being considered functionally analogous to a complex adaptive system by virtue of my primary research question itself that specifically focuses on

operational (i.e. established) business models. Notwithstanding the above exclusions, given that every firm operates at least one business model (Chesbrough, 2007) the number of business models that *can potentially display* characteristics of complex adaptive systems is likely to remain numerically significant.

3.4 Characteristics of the high-technology sector

My primary research question also focuses on business models that operate in the high-technology sector. The choice of sector is based on a seminal paper by Brian Arthur (1996) where he identifies structural differences between sectors in the economy and identifies why some firms in the high-technology sector generate increasing returns. More specifically, Arthur (1996: p.101) has observed that the economy has split into “two worlds of business”. In the traditional parts [sectors or industries] of the economy, Arthur (1996: p.102) suggests that activities are process orientated and “repetitive day to day, week to week”. In Arthur’s view repeating of the same activity leads to decreasing returns, and ultimately equilibrium. Therefore, business models that operate in traditional industry sectors or, alternatively, business models that operate with activities that are substantially repetitive, are unlikely to be complex or adaptive. This is because their development is restricted simply by virtue of the ambition of their existence (lower cost; higher efficiency).

In contrast, Arthur emphasises knowledge-based businesses such as computing and networking companies (e.g. Cisco), Internet firms, semi-conductor manufacturers, and telecommunication firms operate outside equilibrium, respond to positive feedback, are subject to path dependency, and because of this environmental setting can generate increasing returns. These are characteristics of complexity science and

complex adaptive systems. For example, Arthur (1996) associates the concept of *increasing returns* directly to the mechanism of *positive feedback*:

> Increasing returns are the tendency for that which is ahead to get further ahead, for that which loses advantage to lose further advantage. They are mechanisms of positive feedback that operate within markets, businesses, and industries (Arthur, 1996: p.100).

Arthur also identifies firms that have enjoyed increasing returns and highlights Microsoft, Novell, and IBM as key examples. These firms and their sector peers such as Google, Facebook, and Cisco itself have created waves of creative destruction (Schumpeter, 1942) that have fundamentally reshaped the entire economic system. It is likely that not only will the sector's high level of influence continue, but that its impact is likely to expand as technology infiltrates all areas of business and society. Indeed, over time it is probable that the existing structural differences between sectors identified by Arthur (1996) will diminish and it is even possible that the entire economy will come to resemble the high-technology sector in important ways.

Arguably this is already starting to occur and some 'traditional' firms identify themselves foremost as 'technology companies'. Recent examples include (but are certainly not limited to) garment manufacturer Under Armour (Plank, 2016), investment bank Goldman Sachs (Marino, 2015), hotel chain Marriott (Zacjaroah, 2015), and pharmaceutical firm, AstraZeneca (Boulton, 2015). In turn, this implies the unique characteristics of the high-technology sector may apply even more broadly in the future and this will *potentially increase the prevalence and significance of complex adaptive business models in the wider economy.*

3.5 Summary

Certain business models can be conceived as functioning analogously to a complex adaptive system because they are a type of economic system that incorporates a set of interconnected decision-making agents. There are six characteristics that must be observable in a business model for it to be considered a type of complex adaptive system: rules, boundaries, agents, feedback, adaptation, and emergence. If a business model is operating in a restricted mode, it cannot function analogously to a complex adaptive system. I thus exclude any business model that operates under conditions of significant restriction. Based on Arthur (1996) I highlight the high-technology sector as having the necessary structural architecture to support a complex adaptive business model.

4 METHOD

4.1 Approach

My research addresses how operational business models evolve in practice. Determining how change and evolution occurs in business models is the number-one research priority of business model scholarship (Wirtz et al., 2016) and my own motivation is aligned to this research priority. Following Alvesson & Sandberg (2011, 2013), my primary research question was developed by problematizing the *mainstream perspective* on business models. Through this assessment, I identified that several assumptions attach to mainstream business model theory yet conflict with observable phenomena in the economic system in which business models reside.

I adopt strategy-as-practice (Jarzabkowski, 2005; Whittington 2006; Paroutis et al., 2013; Golsorkhi et al., 2010; 2015) as my broad theoretical lens because it intersects with my requirements in three critical ways. First, it is congruent with my ambition of understanding how change in business models occurs in the absence of either controlling direction from management or a conscious strategy (i.e. 'how do business models change themselves?'). Second, it works to redress faulty assumptions made in mainstream strategy research such as those I have identified in the mainstream perspective. And finally, it is broad in the sense that it can be adapted to address traditional and non-traditional views of strategy.

More specifically, I address my primary research question by extending the *evolutionary perspective* on business models into complexity science and I propose that *certain business models function analogously to a complex adaptive system*. I

have aligned my supporting research questions to identify whether characteristics of complex adaptive systems are present in an operational business model.

In this chapter, I outline my methodological approach in detail. I sketch the research design framework I have adopted, I account for my choices of epistemology and theoretical perspective, and finally, I justify my specific research method (a multi-method, multi-case, case study on Cisco Systems).

4.2 Research design framework

To ensure my overall research approach is both rigorous and appropriate, I adopt Crotty's (1998) research design framework. Crotty's research design framework is seminal in the social sciences because it provides a structure through which a researcher can resolve a number of deeper questions about their proposed research before the final method is defined. Crotty achieves this by dividing thinking behind any research into four discrete "elements" (Crotty, 1998: p.2). Each element in Crotty's research hierarchy is accessed by a deceptively simple question. Crotty has designed his approach so that in answering each question the researcher is also required to address many further questions about their research, including its purpose and the researcher's own aims, ambitions, and biases. The questions Crotty (1998: p.2) asks a researcher to address are:

1. What **methods** do we propose to use?
2. What **methodology** governs our choice and use of methods?
3. What **theoretical perspective** lies behind the methodology in question?
4. What **epistemology** informs the theoretical perspective?

I have followed Crotty's framework starting from the highest perspective (epistemology).

4.2.1 Epistemology

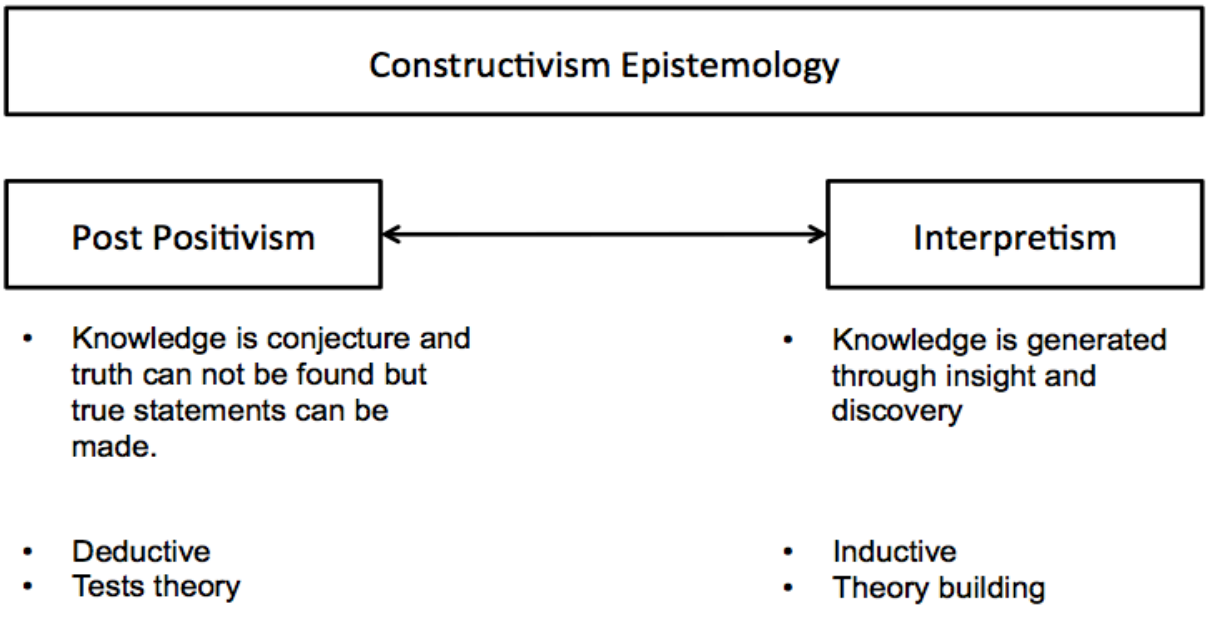
According to the *Stanford Encyclopaedia of Philosophy*, epistemology relates to the study of knowledge and justified belief (Steup, 2013). Determining an appropriate epistemology raises the question: 'what do we actually know?', a very difficult and uncomfortable question. Fortuitously, Bryman & Bell (2007) narrow the question of epistemology to "what is regarded as *acceptable in the discipline*?" (p.16) and I adopt the approach of determining the choice of epistemology in the context of the discipline of management which includes strategy, strategy-as-practice, and business model scholarship. Out of the possible epistemologies of objectivism, constructivism and subjectivism, only the first two are widely accepted in management and organisation studies. Moreover, my choice narrowed further because of my own direct involvement in the research. On introspection, I felt it would be nearly impossible to remain appropriately objective due to my involvement and I thus adopt a *constructivist epistemology*.

4.2.2 Theoretical perspective

On the continuum associated with a constructivist epistemology, two major theoretical perspectives are broadly identifiable in the domain of management and organisation studies: post-positivism and interpretism.[10] I have provided a high-level synopsis of each in Figure 8, below.

[10] Other perspectives such as *feminism* and *critical theory* are possibly valid but not widely referenced in management literature and have therefore been excluded for the purposes of determining my research method.

Figure 8: Summary of major theoretical perspectives in management research



Source: Crotty (1998), Gray (2009), Feast & Melles (2010).

After contrasting the characteristics of each perspective against my primary research question, I ultimately adopted an *interpretive perspective.* Interpretism is attractive because it is a discovery-orientated approach that has a long tenure in the social sciences. One important benefit applicable to my research is that it explicitly acknowledges that the study of social phenomena requires an "understanding of the social worlds that people inhabit" (Lewis-Beck et al., 2004: p.509). This is an important distinction because business models are at least partially if not entirely social constructions. This adoption therefore removes a potential *theoretical conflict* between system theory and my research into complex adaptive business models. Indeed, if I had attempted to *directly* associate complex adaptive systems as they are understood in the natural sciences with business models the conflict would be extreme. This is because system theory as it applies in the natural sciences does not account for social variables such as the way people 'feel' when they engage with a

business model; an important aspect for stakeholders assessing the notion of 'value'. Instead, I have followed Stacey (2007) in *not* directly equating business models with complex adaptive systems and as mentioned in Section 2.3.5, I align with Castellani & Hafferty (2009) and other researchers from the social sciences who do consider social awareness in their interpretation(s) of system theory. More specifically, I have addressed the conflict by asserting business models function *analogously* to a complex adaptive system; in essence I use complex adaptive system theory as a metaphor for how a business model works instead of as an absolute description. As a consequence, my research is different from research undertaken on complex adaptive systems in the natural sciences, in economics (which is completely based on mathematics) and from computer-simulated complex adaptive system research. Adopting an interpretative lens therefore provided a way to address uniqueness and subtleties I expected to arise in my research that necessarily included an organisational setting and involved people.

4.2.3 Methodology

In adopting a methodology for my research, I encountered a complication in the guise of my realisation that some characteristics of a complex adaptive business model are *much* harder to identify than others. My problem was also compounded by Holland (2006) who has assessed the techniques used to study complex adaptive systems from a natural sciences' perspective. Holland observes "some of our most powerful research tools are of limited help in understanding complex adaptive systems" (p.1) and explains that this is because of the extremely high number of variables and interdependences that are involved with complex adaptive systems.

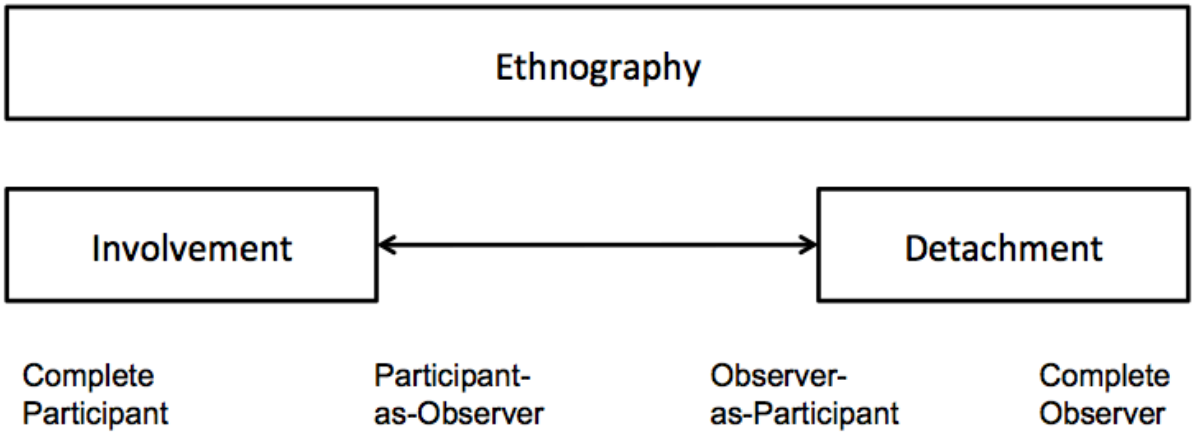
From a social sciences' perspective, Stacey (1995) provides guidance that reconciles this issue by highlighting that instead of trying to find linear, causal relationships, it is necessary to look for "patterns and their systemic implications" (p.493). For Stacey, this requires a researcher to interpret the 'meaning' of the pattern and to reason about the system itself based on the pattern. Stacey has proposed that suitable research methodologies exist in management and organisation studies and include: longitudinal studies, action research, ethnography, and clinical methods (p.493). The guidance provided by Stacey is particularly important because it is provided in the specific context of strategy research and I therefore adopted it for my own purposes.

However, while I adopted Stacey's guidance, I rejected three out of the four specific research methodologies he proposes. To the best of my knowledge, the clinical method is not widely used in management research and therefore conflicts with Bryman & Bell's (2007) guidance introduced earlier. Action science on the other hand is regularly employed, but it would have introduced a high risk of research being confounded through my own action(s) as a researcher. In essence, I needed to avoid any potential change to the business model that I could potentially trigger and so I avoided action research as a potential methodology. I rejected longitudinal studies for purely practical reasons; in order to finish my dissertation, I did not have the necessary period of time to devote to a full longitudinal study which can take many years to fully complete.

This leaves *ethnography* as the remaining possible methodology proposed by Stacey. According to Miller & Brewer (2003: p.100) ethnography should be understood broadly as 'field research' and defined as "the study of people in naturally

occurring settings or 'fields' by means of methods which capture their social meanings and ordinary activities, involving the researcher participating directly in the setting (if not always the activities) in order to collect data in a systematic manner but without meaning [change] being imposed on them externally". Understanding ethnography broadly enables a researcher to span the continuum of involvement to detachment identified by Gold (1958) as represented in Figure 9.

Figure 9: Theoretical continuum of involvement of researcher in ethnographic research



Source: Gold, 1958.

However, because I find it challenging to disassociate from situations where I am deeply involved, a high risk still remained that my objectivity would have been threatened in some situations. Ultimately, this is the same risk of my research being confounded as identified in action research. I therefore adopted ethnography as my methodology but with a restricted involvement of 'observer-as-participant' (Gold, 1958).

In this regard by taking a less involved approach to the research setting I align with the interpretation for ethnographic research in management provided by Watson (2011: p.202):

> Ethnography is not a research method. It is a way of writing about and analysing social life… whilst it prioritizes close and intensive observation in the gathering of information and insights, it may additionally and potentially use any of the full range of other research methods.

Moreover, seeing ethnography as non-deterministic enabled significant flexibility in determining details of my research method itself. For example, in the following section I outline that I incorporate multiple data types (primary and secondary) and collection methods into my final case study design. Finally, my approach to collecting data was based on having open access to participants and information (Bryman, 2015) from which I generate data for analysis. This was fundamental benefit and one that influenced my choice for conducting research on Cisco. I discuss each of these benefits below.

4.2.4 Method

In this section, I outline why Cisco itself is appropriate for my research before I outline the Cisco business models in the scope of my research. In Section 7.1.3, I also indicate why I have focused on a single firm and why results from a case study on Cisco's business models may be *transferrable* (Eisenhardt, 1989; Aken, 2004) to Cisco's peers in the industry. However, before doing so, I must reiterate that *my research investigates my employer*, *Cisco*. This raised the potential for introducing personal bias into my results. It was this risk that necessitated my exclusion of action

research as a potential research methodology and also the voluntary restriction(s) I placed on my direct involvement in the research setting following Gold (1958). The employer/employee relationship also informed my selection of a specific research *method*. Ultimately my method selection had to balance the risk of introducing bias into my results against the benefit of being able to access high quality data that would have likely been unavailable to researchers operating from outside Cisco.

In fact, gaining appropriate access to organisations in order to conduct high quality research is significant and Bryman (2003) highlights that resolving the access problem is *uniquely challenging* in organisational studies. Bryman also indicates that research *without appropriate access* is likely to be *compromised* in many unseen and unacknowledged ways. For example, he highlights that in quantitative survey research response rates have been dropping over time which is typically undisclosed by scholars. Bryman thus states:

> Organisational research often entails substantial negotiation to obtain access to firms and their members… consequently problems of access tend to preoccupy organizational researchers a great deal (Bryman, 2003: p.2).

Furthermore, it would have also *been very unlikely* that I would have been able to gain access to or cooperation from similar firms in the industry that compete with Cisco. In essence, none of these firms would have been welcoming to a 'competitor employee'.

Selection of a method also had to conform with acceptable research methods for both investigating business models and also acceptable research methods for

investigating complex adaptive systems. I found this latter point helpful in refining potential methods for consideration because it allowed me to identify and exclude methods that were not universally accepted across business model and complexity scholarship alike. These excluded methods were:

- Pure mathematical models, including:
    - Statistical methods for representing systems including ordinary differential equations, difference equations and partial differential equations (Ahmed et al., 2005).
    - Stochastic spatial models similar to those developed by Durret & Levin (1994).
    - Fractional calculus.
- Cellular automata, including:
    - Models related to biological structure, chemical structures etc.
    - Models related to computers, computer processes, etc.
    - Games (e.g. Gardiner, 1970).
- Agent-based modelling, including:
    - Mathematical based agent based models.
    - Computer based agent based models (Axelrod, 2006).
- Network methods, including:
    - Investigating the “power law” (Bak & Chen, 1991).
    - Models related to “small worlds” (Milgram, 1967; Watts, 1999).

After making these exclusions two further major potential methods remained for consideration:

1. Game theory; and
2. Case studies.

However, game theory is ill-suited to highlighting the predominant complexity characteristics of adaptation and emergence *in context of strategy research*. For example, it requires participants to conform to many simplifying (essentially neoclassical) assumptions such as rationality and the imperative for profit-maximisation. At the very least, game theory requires participants to have a high cognitive ability in order to assess various options and make a decision (Janssen, 2005). Game theory is also best suited to being studied in a controlled environment and therefore more closely aligns with a positivist theoretical perspective and an objectivist epistemology. For these reasons, I also excluded game theory as a potential method.

In contrast to methods that make assumptions about the real-world environment, the case study method does not seek to simplify the setting or phenomenon it investigates. Instead the case study method embraces environmental complexity. It can be defined as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used" (Yin, 2009: p.18). Yin also observes that all case study research starts from the same compelling feature: the desire to derive an up-close or otherwise in-depth understanding of a single or small number of "cases" set in their real-world contexts (Yin, 2011; 1990).

Significantly, the case study method also works to enhance personal efforts at remaining objective. This is because case study research operates to falsify preconceived notions:

> The case study contains no greater bias toward verification of the researcher's preconceived notions than other methods of inquiry. On the contrary, experience indicates that the case study contains a greater bias toward falsification of preconceived notions than toward verification (Flyverg, 2006: p.20).

Furthermore, the case study method has also been used widely by authors investigating business models, including Osterwalder (2004); Chesbrough & Rosenbloom (2002); Markides & Charitou (2004); Ojala & Tyrväinen (2006); Calia et al., (2007); Demil & Lecocq (2010); Nielsen & Montemari (2012), Rajala et al., (2012); Bucherer et al., (2012); Rohrbeck et al., (2013) and Kristiansen et al. (2015) and, separately, by authors investigating complex adaptive systems in the social sciences including Morse et al. (2013); Lindbert & Schneider (2012); and Fuller & Moran (2001).

The general characteristics of the case study method also tie closely with: (i) the ethnographic methodology I adopted; (ii) the opaque nature of the characteristics of complex adaptive systems I am attempting to identify in business models through my supporting research questions; (iii) the requirement to assess business models in a 'real-world' environment; and (iv) my overall strategy-as-practice lens. Consequently, I adopted a *case study* as my method. My completed research hierarchy is outlined in Figure 10:

Figure 10: Complete research hierarchy

Epistemology	Theoretical perspective	Methodology	Methods
Objectivism Constructionism Subjectivism (*and their variants*)	Positivism (and post-positivism) Interpretivism • Symbolic interactionism • Phenomenology • Hermeneutics Critical inquiry Feminism Postmodernism *etc.*	Experimental research Survey research Ethnography Phenomenological research Grounded theory Heuristic inquiry Action research Discourse analysis Feminist standpoint research *etc.*	Sampling Measurement and scaling Questionnaire Observation • participant • non-participant Interview Focus group Case study Life history Narrative Visual ethnographic methods Statistical analysis Data reduction Theme identification Comparative analysis Cognitive mapping Interpretative methods Document analysis Content analysis Conversation analysis *etc.*

Source: Crotty (1998); author's selections overlaid.

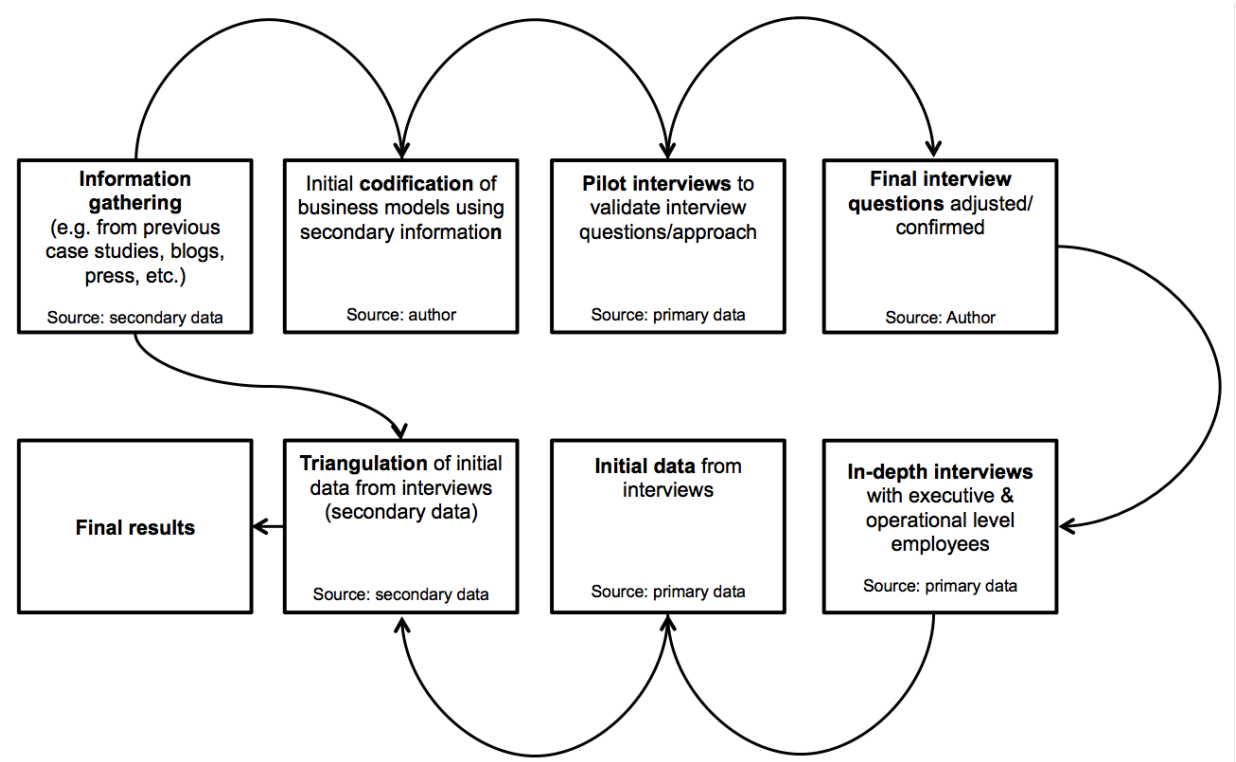
4.3 Detailed case study design

In determining the detailed structure of the case study, I adopt an *inductive design* (Eisenhardt & Graebner, 2007) that employs *multiple sub-methods*. In this regard, my case study loosely follows a structure established by McDonald & Eisenhardt (2014) in their investigation of viable business models for firms competing in 'new markets' (also predominantly based on firms operating in the high-technology sector). Similar to McDonald & Eisenhardt (2014), my case study uses multiple data sources,

including: gathering and interpreting public corporate information, using public blog entries and conducting in-depth interviews.

Overall, my case study was structured as follows: First, I collected and collated secondary, publicly available, information on Cisco. In particular, I focused on gathering information posted on Cisco's website (www.cisco.com), its employee 'blogs' (www.blogs.cisco.com), press releases and public statements made through Cisco's corporate communications platform (https://newsroom.cisco.com), and previous case studies or research published on Cisco itself. From this information, I documented a draft of the Cisco business models in the scope of my research and developed detailed in-depth interview questions. Next, I conducted five pilot in-depth interviews to ensure my interview questions were generating appropriate primary data against which I could address my research questions. After required refinement, I conducted twenty-two in-depth interviews with both executive-level employees involved with Cisco's business models and separately with operational-level employees involved with the business models on a day-to-day basis. Finally, where possible I triangulated (Flick, 2007; 2009) the primary data generated in my in-depth interviews by confirming and/or contrasting it with secondary data collected on Cisco. My overall case structure is represented in Figure 11.

Figure 11: Summary of case study structure



4.3.1 Cisco

Cisco is a major corporation that operates in the global high-technology sector and sells high-technology Internet hardware products and services to its customers. Cisco has a current market capitalisation of $161.04 billion US dollars and total revenues in 2016 of $49.2 billion US dollars.[11] Significantly, aligning with Arthur's (1996) sector observations, Cisco has previously achieved increasing returns witnessed in its historical success in its core networking and switching business

[11] Cisco market capitalisation on Wednesday 15th June 2016. Figures are in $USD. Source: Google Finance http://www.google.com/finance.

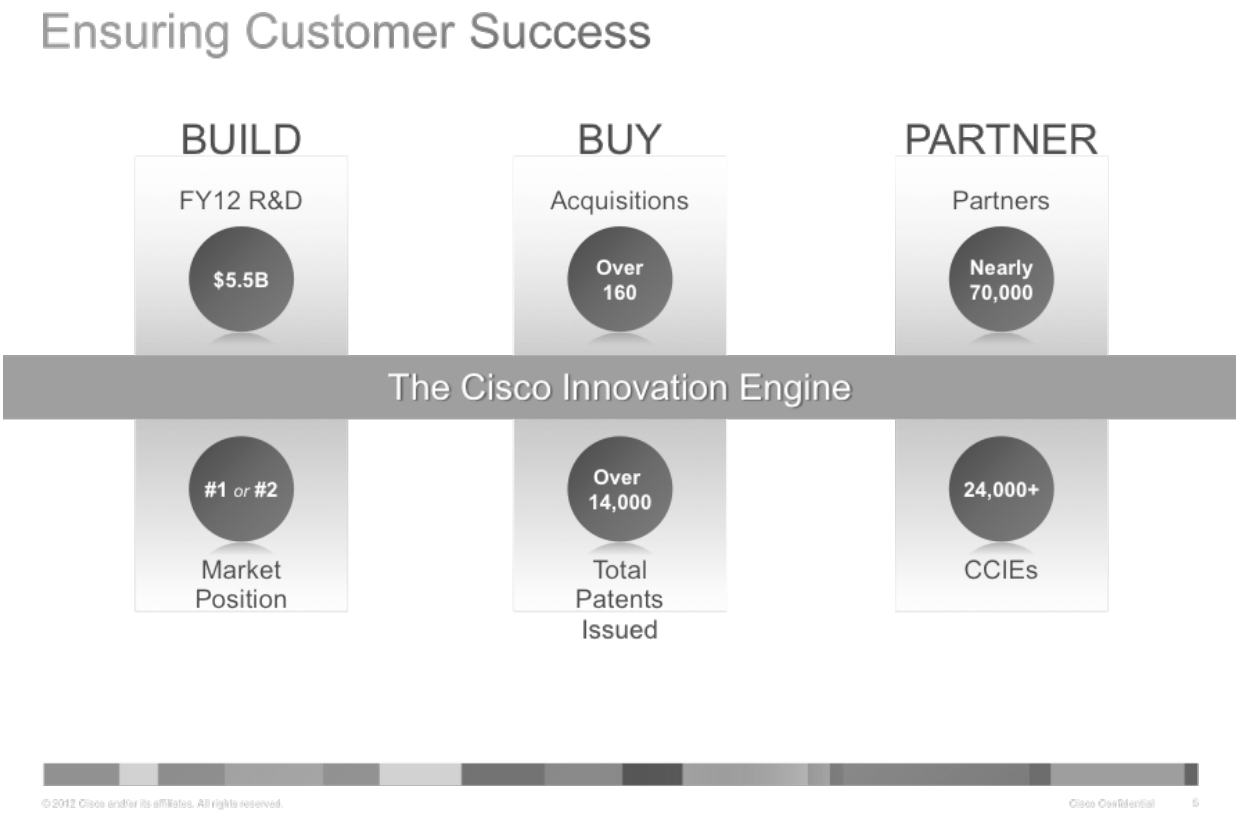
(Gawer, & Cusumano, 2002; Earle & Keen, 2002; Wirtz et al., 2007; Highsmith, 2013).[12]

Previous case studies have established that Cisco's business models are highly integrated with its partner and supplier community (Chesbrough & Schwartz, 2007), indicating Cisco embraces a 'system centric' view of its business. Indeed, Cisco estimates that while it employs 66,000 people, there are actually at least another 200,000 individuals directly involved with Cisco's business activities when partners and suppliers are included. One way this can be triangulated is by highlighting that Cisco has 70,000 direct partner relationships with external firms and leverages 24,000 Cisco certified ('CCIE') external engineers to help resolve issues and with design solutions for its customers. These formal data points are summarised in Cisco's corporate overview presentation (Cisco, 2014), an extract of which is provided in Figure 12, overleaf.[13]

[12] In their book *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation* Gawer & Cusumano (2002) refer to Cisco's success as 'platform leadership'. Cusumano (2010: p.33) highlights that an industry platform has the "critical distinguishing feature of creating 'network effects' which are themselves positive feedback loops that can grow at geometrically increasing rates".

[13] I have used Cisco's 2014 corporate overview presentation because it provides the slide referenced in Figure 12. Cisco's 2015 and 2016 corporate presentations moved to a different format and did not include a similar slide.

Figure 12: Extract of Cisco's corporate overview presentation – partnering highlights



Source: Cisco Systems, 2014: p.4.

In the same extract above, Cisco also indicates that partnering is one of its three corporate strategic pillars (in addition to building and buying strategic capability). Cisco's partnering ethos is so pervasive and central to the firm's continuing success that Don Tapscott, a prominent writer on the subject, recognises Cisco as the pioneer of the 'business-web' concept mentioned earlier in the chapter: "Cisco pioneered the business web – that is, a network where you focus on what you do best and partner for the rest" (Tapscott, 2014).

Finally, Cisco is a large and mature firm that operates over multiple product segments and geographies. This is significant because for Cisco to support its large product and solution portfolio it necessarily operates multiple business models. For example, the business model applicable to Cisco's security product suite is distinct from the business model Cisco operates for its Tele-medicine practice (Cisco Internet Business Group, 2013). Housing multiple business models, applicable to different areas of its solution portfolio, is attractive because some portfolio areas are necessarily mature whilst others are recent. For example, Cisco has recently launched a new business model focused on 'smart services' that is focused around "sophisticated software automation" (Subramanian, 2016). In combination, this provided a wide variety of potential Cisco business models on which to focus the case study.

4.3.2 Cisco business models

My case study included two separate business models operated by Cisco:

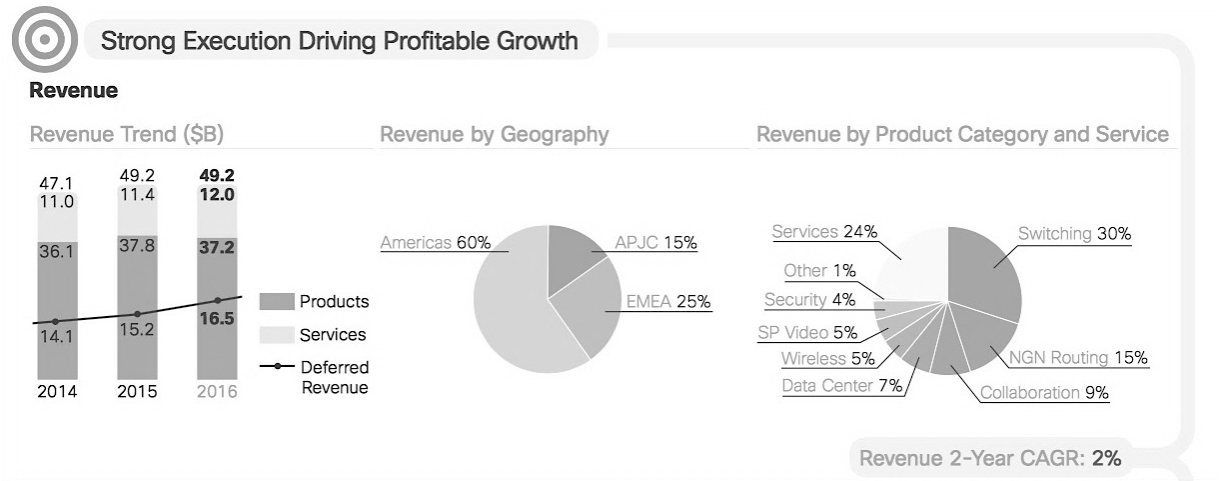
1. *The Cisco Product business model*: operated by Cisco's core routing and switching business unit.

2. *The Cisco Services business model*: operated by Cisco's services division.

The Cisco business models I selected for my case study were distinct; one involved *tangible* artefacts in the form of Cisco's hardware and equipment (the Product business model) and one involved *intangibles* in the form of Cisco's professional and technical support services (the Services business model). Importantly each business

model had been operating for over 10 years and combined they account for 90% of Cisco's revenues in the 2016 financial year as outlined in the 'revenue trend' graphic contained in Figure 13, below.

Figure 13: Extract of Cisco's corporate overview presentation – financial highlights



Source: Cisco Investment Relations, 2016: p.4.

Two business models were also selected to allow *cross-case conclusions* to be drawn (Yin, 2009). According to Yin, there is no predetermined minimum nor maximum number of cases that are required in order to ensure results are rigorous but that "replication logic does apply" (2009: p.54) and that multiple cases are analogous to conducting multiple experiments (Hersen & Barlow, 2009: p.54). For these reasons, investigating a single case would have been insufficient for providing the necessary depth required by my research. Correspondingly, further extending research into additional Cisco business models would have been unlikely to have generated new or unique findings. This is because the business models selected were representative of Cisco's approach to its major market segments and through

their size, scale, and longevity, both incorporate Cisco's corporate ethos, culture, and organisational support processes, support, and tools.

4.3.3 Documenting Cisco's business models

Properly defining and documenting each business model was an important aspect of my case study design and was required before I could properly address my research questions. Simply stated, without knowing the activities (Porter, 1996), deliverables, participants, and boundaries of each business model, assessing the extent to which characteristics of a complex adaptive business model were present would have been impossible.

I therefore documented Cisco's business models using a two-step process built into the overall case study design. First, I developed an initial draft representation of the applicable business model using secondary, publicly available information. My initial representation was then used as an interview exhibit and discussed with each interview participant. This allowed for confirmation and/or adjustment of my interpretation of the respective business model. This approach had the benefit of both removing personal bias from the representation of the business model and establishing a joint understanding between the interviewer and interviewee regarding the object of the interview itself. However, before confirming this approach I had to overcome a particular challenge; that of determining *how to actually document* a business model.

For example, notwithstanding the relative specificity of my adopted business model definition, when I considered documenting, describing, or representing Cisco's business models, I found it, and many other definitions (see Section 2.1.2),

problematic because it raised difficult downstream questions that I was unable to properly address. For example, defining the overall scope and boundaries of the business model system and determining how value is generated was challenging. Ultimately I reconciled this problem by leveraging a widely-used framework to document the business models in the scope of my case study. Of the frameworks I considered, namely the 'business model canvas' (Osterwalder et al., 2010), 'value chain' (Porter, 1985), and 'activity systems' (Porter, 1996) concepts, I ultimately adopted Porter's 'activity system' concept.[14]

Adopting the activity system framework is appropriate because the concept of an activity system itself is tied to viewing the business model as a dynamic and operational multi-stakeholder construct, that positions the firm as one actor (or in complexity science language, one agent) in a broader system. Moreover, influential business model scholars Zott et al. (2009) have assessed the activity system concept in the context of business models and support its association. Indeed, these authors specifically highlight that "questions about business model design can be framed as questions about activity systems" (p.221). Due to the centrality of the activity system concept in my research design, a number of its unique advantages are outlined in further detail below.

First, the activity system [business model] links the participants involved with the creation of value in an interconnected system. The activity system itself is orientated around the concept of 'activities'. Porter (1996: p.63) defines activities broadly as "activities required to create, produce, sell, and deliver products or services". This definition therefore does not require the firm to 'own' or 'perform' any or all activities

[14] I acknowledge the irony that 'activity systems' were introduced by Porter (1996) in an article criticising the very idea of a business model.

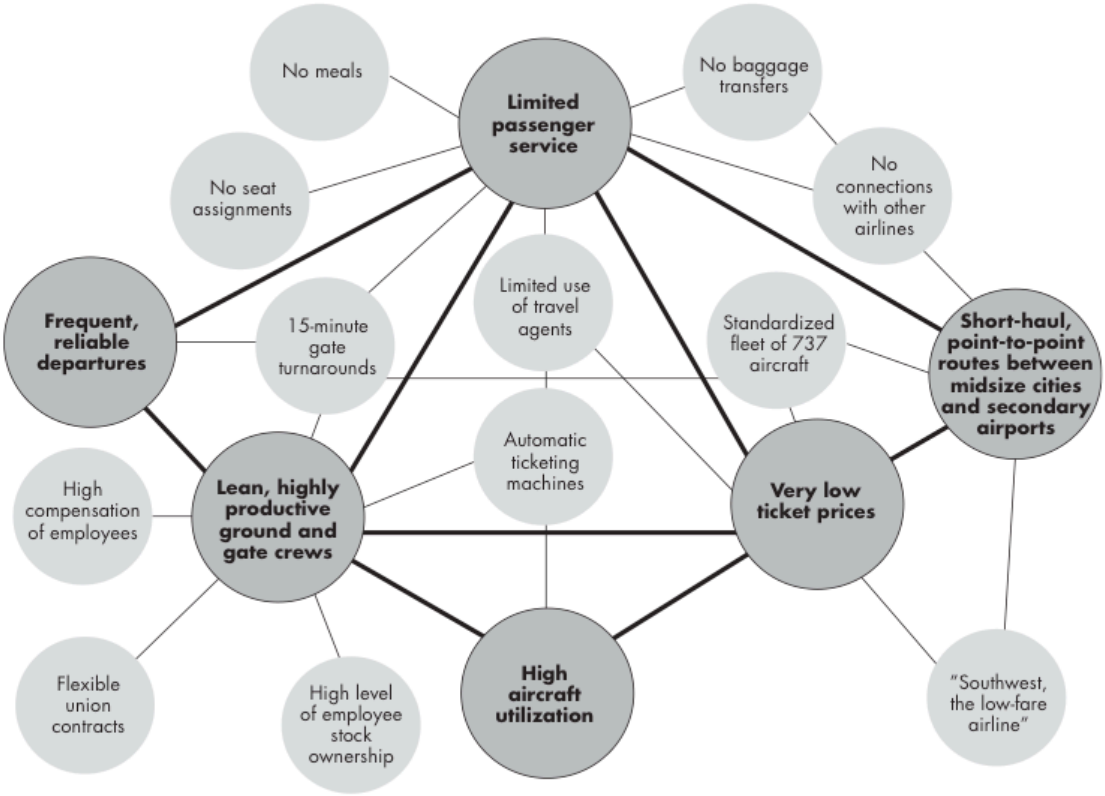
involved with their business model. Consequently, this enables the overall business model system to extend past the firm's boundaries. Moreover, this enables shared activities in the business model to be easily captured and therefore overcomes difficulties in having to determine precise roles for each stakeholder. Moreover, broadly described activities can then be closely aligned with participants' decisions on what they will do and how they engage with the business model. For example, if an activity in the business model is 'ship product to end-user', a firm can decide which supplier is selected for this task, and correspondingly the supplier can decide whether they wish to perform that activity. The activity can even be performed by different actors under different circumstances highlighting the flexibility inherent in having a framework that is independent from the firm. In addition, the activity system concept then enables interdependencies between activities (and therefore participants and decisions) involved with the business model to be captured at multiple levels. This in turn leads to the ability to assess the business model in terms of inputs and outputs or even fit between activities, the firm, and other participants (Porter, 1996). Furthermore, the activity system concept aligns the concept of viewing the firm as an orchestrator but not necessarily an owner (or even controller) of 'its' business model. In this regard, the framework focuses attention on the importance (for the firm) of understanding interactions between participants in its value system. This latter point has also been identified by Zott et al. (2009: p.224) who note that "[the activity system concept] points to the importance of social action and interaction as the micro-foundations of business model performance".

Further, once the firm is seen as a single actor in the activity system and thus a contributor to, rather than *the* creator of value, the concept of an activity system becomes practically indistinguishable from the nominally 'broader' concepts of

‘business webs’ (Tapscott et al., 2000) and ‘value networks’ (Allee, 2003). Interestingly, both use a documentation methodology called ‘value mapping’, which has striking visual similarities to Porter’s activity systems. From my perspective, all three concepts share the same benefits described above and their alignment thus builds credibility for the adoption of the activity system concept.

Finally, a significant benefit of the activity system concept is that it is highly visual which allows for easy comprehension and communication. This is a unique benefit which I weighed heavily given the challenges in describing business models; for many people it can resolve the question ‘what is the system?’ and ‘how is value created’ in a format which is immediately understandable. I have replicated the activity system outlined for Southwest Airlines by Porter (1996) in Figure 14 to highlight the described features of activity systems.

Figure 14: Activity system [business model] for Southwest Airlines



Source: Porter (1996: p.14).

Please note, from this point on, I will restrict further references to activity systems and simply refer to business models. The Southwest Airlines activity system above would therefore be the 'Southwest Airlines business model'.

4.3.4 In-depth interviews

In-depth interviews were the most important aspect of the case study, in the sense that they generated primary data. My in-depth interviews were conducted in two phases, similar to how McDonald & Eisenhardt (2014: p.11) conducted "two waves" of interviews. The interview structure was also based on McDonald & Eisenhardt's approach: it was discovery-orientated, semi-structured, and contained open-ended

questions. The first phase consisted of conducting five in-depth pilot interviews. The pilot interviews were undertaken for the purpose of assessing and confirming that my interview questions were: understandable by the interviewees; that appropriate data were generated in response; to determine whether any questions needed to be refined; and to assess whether the overall interview approach needed adjusting. Importantly, the pilot interviews enabled adjustment of the research design for the main phase of interviews. The five pilot interview participants were randomly selected on convenience (Bryman, 2015) from Cisco's internal directory. Following completion of the pilot interviews, a second phase of interviews was conducted using a purposeful sampling approach that placed my research questions at the "heart of [my] sampling considerations" (Bryman, 2015: p.407). Specifically, I determined that in order to address my research questions I should interview two distinct groups: executive-level and operational-level employees. The sampling selection criteria used for each group are briefly discussed below:

Executive-level employees: interviews were conducted with five senior executives as listed in Table 11. The specific rationale for selecting these participants is provided in the same table, however, the integrating theme across all selected interviewees is that they have responsibility for setting, moderating, or localising Cisco's business models.

Table 11: Summary of interviewees at Cisco executive-level, with reasons for selection

Position Title	Rationale for Interviewing
Senior Director Enterprise Switching	• Executive responsible for Routing & Switch business. • Sets overall sales approach and holds full profit & loss accountability.
Director Strategy & Cloud	• Executive responsible for Cisco Australia & New Zealand's strategy and market approach. • Responsible for localising any Cisco business model to the Australian & New Zealand marketplaces. • Executive responsible for Cisco Intercloud business model in Asia Pacific.
Director Operations	• Executive responsible for operation and service delivery of all Cisco business models. • Manager for over 1000 staff.
Senior Director Services	• Executive responsible for Services business model in Asia Pacific & Japan. • Sets sales approach and targets. Holds full profit & loss accountability.
Vice President Services	• Executive responsible for Services business model. • Manager of over 5000 staff.

Operational-level employees: interviews were conducted with nineteen staff involved with daily operational aspects of Cisco's business models (any or all). These employees were selected using Cisco internal directory; first, by role type (e.g. 'Partner Manager' and all of its derivations such as 'Partner Executive') and, then, by randomly selecting potential participants inside each category. To achieve a balanced selection each category included at least three individual participants. Categories and the rationale for their inclusion are included in Table 12, overleaf. A full list of interview questions used across executives and operational staff can be found in Appendix 5. I have also provided selected interview questions mapped to my supporting research questions in Table 13, on the following page.

Table 12: Summary of interviewees at operational-level (identified by title), with reasons for selection

Position Title	Rationale for interviewing
Partner Manager	• Responsible for the relationship between Cisco and its registered partners. • Responsible for modifying Cisco's business models for each partners' unique requirements.
Sales Manager	• Responsible for the relationship between Cisco and its end customers. • Primary communication point between end-customers and Cisco. • Responsible for ensuring the business model meets corporate revenue guidelines or targets.
Procurement manager	• Responsible for procuring products required by Cisco to operate its business models.
Supply Chain (logistics) Manager	• Responsible for managing Cisco's product supply chain (logistics) from factory to delivery. • Primary communication point between Cisco and its supply chain participants.
Services Manager	• Responsible for Cisco's services business model and/or service delivery on purchase of Cisco equipment and/or solutions. • Primary communication point for any post-sale issues (for any Cisco business model).

Table 13: Selected in-depth interview questions

Expected characteristic and supporting research question	Selected in-depth interview question(s)
RULES What rules and guidelines are identifiable in the business model?	• Are there organisational policies or guidelines associated with the business model? • Who manages the business model?
BOUNDARIES What boundaries are identifiable in the business model?	• How is the business model controlled? • What can't you change in the business model?
AGENTS How does the business model empower its participants to make decisions?	• Do you feel generally empowered in your role? • Are you empowered to make decisions regarding the business model?
FEEDBACK How does the business model exhibit feedback?	• Do you receive information on the business model? • How do you react to negative information about the business model?
ADAPTATION How does the business model achieve continuous change?	• How often do you change what you are doing in the business model? • How do you react to non-standard requests from customers?
EMERGENCE How does the business model change in unplanned or unexpected ways?	• How long has the organisation had the same business model? • Has it changed over time? • Have any changes in the business model surprised you?

In aggregate across the pilot-, executive-, and operational-level interviews, the case study consisted of *twenty-seven individual in-depth interviews*. While this is a seemingly small sample, it must be re-emphasised that my research was not intended to generate representative results, but rather to indicate whether it is *theoretically possible* for operational business models to be considered analogous to

a complex adaptive system in their function. In this regard, I sought to generate insight from each interview consistent with an inductive approach to theory-building and thus focused on generating "rich understanding that may come from the few rather than the many" (O'Leary, 2004: p.104).

4.3.5 Triangulation using secondary data

My case study design involves using two methods to ensure any findings are *triangulated*. According to Flick (2009: p.447) triangulation itself is not a "design per se, but can be used in a variety of qualitative research designs" and is particularly useful when researchers are aware of potential areas of bias in their research. Due to my relationship with Cisco and the introduction of potential personal bias, as disclosed, I triangulated in two ways. First, in accordance with Section 4.3.3, I confirmed my initial representations for each business model by discussing them at length with each interview participant. Second, wherever possible I used secondary, publicly available data, to compare and substantiate potential findings for my research questions as generated from the in-depth interviews. By purposely contrasting my data, generated internally to Cisco through my actions as a researcher, with data independently generated I conformed to the definition for triangulation:

> Triangulation means that researchers take different perspectives on an issue under study or – more generally speaking – in answering research questions. These perspectives can be substantiated in using several methods and/or in several theoretical approaches. Both are or should be linked (Flick, 2007: p.41).

Furthermore, continuing to follow McDonald & Eisenhardt (2014) on whom I based my general case study design, I also focused on triangulation using secondary, publicly available, data because it provides a large number of potential data sources. These sources range from the firm itself, to researchers who have investigated Cisco, to its customers and partners who comment on Cisco in the public domain, to professional stock assessments and reports, and the large number of news and journalist articles generated about Cisco. I furthermore focused on employee blog sites because they provide "real-time data free of retrospective bias" (McDonald & Eisenhardt, 2014: p.11). Ultimately, by using secondary data I was able to access a large number of varied data sources that in turn increased the possibility for triangulation and thus the potential quality of my findings:

> Such varied data enables triangulation among sources, strengthening data accuracy and the quality of inferences (McDonald & Eisenhardt, 2014: p.11).

4.4 Summary

In this chapter, I have outlined my methodological approach to my research. To ensure my overall research approach is rigorous I adopt Crotty's (1996) research design framework and address each element in Crotty's research hierarchy starting with resolving questions of epistemology. On completion of the research hierarchy, I determined that an ethnographic case study was an appropriate research method, but my personal involvement should be restricted to the role of *participant-observer* (Gold, 1958) only.

I selected Cisco because although not seeking to generate representative results, results from this firm have the potential to be transferrable (Eisenhardt, 1989; Aken,

2004) to Cisco's peers in the industry (discussed further in Section 7.1.3). Furthermore, as an employee of the firm I was able to resolve organisational access issues which often obstruct and/or stymie organisational researchers. I clarify how I worked to remain objective and minimise the possibly of introducing personal bias into my results. In my case study design, I assess multiple cases and use multiple sub-methods. To document business model I adopt Porter's (1996) activity system concept.

5 Results

Before discussing the results generated after conducting my empirical work in the field, I first provide some background information on the interviews and interview participants, followed by an outline of the raw data generated by my research. I then detail the process employed to organise and code collected data for further analysis. Following this, I provide definitive representations of Cisco's Product and Services business models. Comprehensively and accurately documenting each business model was required before I could address my supporting research questions and thus determine the extent to which complex adaptive business model characteristics were evident in the respective business models. Following these definitions, I address my six supporting research questions individually. For each, I outline the data generated through my in-depth interviews and where possible triangulate my results using secondary, publicly available information. In the penultimate section of the chapter, *I address my primary research question*.[15]

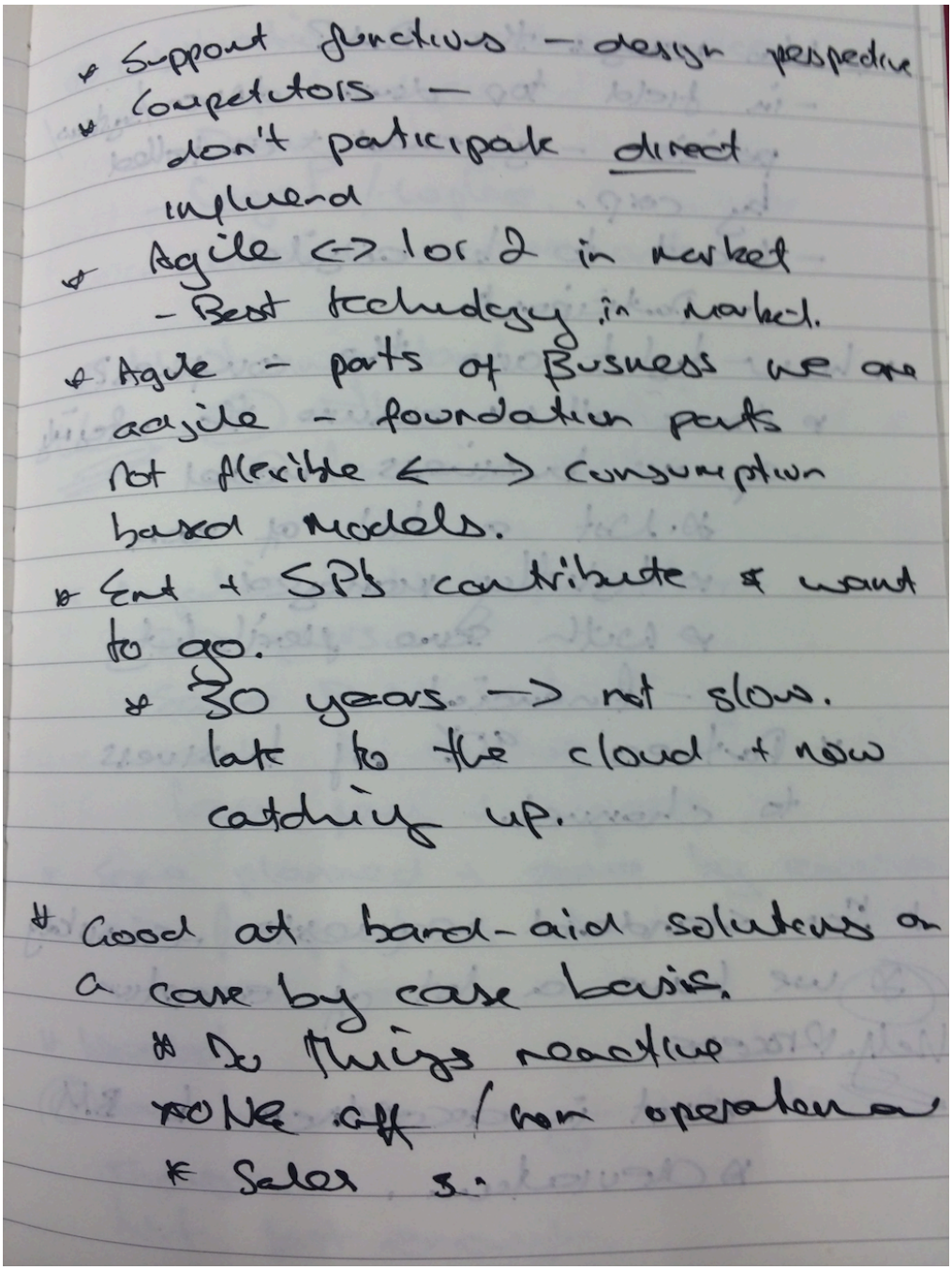
5.1 Background information on interviews and interview participants

An important aspect of situated ethnographic case study research is to capture data, as close as possible, to its original context (Simons, 2009). Therefore, consistent with my ethics' approval, all in-depth interviews were conducted on Cisco's premises in a quiet and private room in North Sydney. The interview room itself was set up prior to the interviews to be welcoming for interview participants and an unobtrusive but high-quality directional voice recorder was used to capture audio. To supplement recorded

[15] In this chapter and my results more broadly, I have anonymised interview participants by assigning each with a unique name. Consequently, executive-level employees have names starting with 'E' (for example, Edward, Eva, etc.) and operational-level employees have names beginning with 'O' (for example, Olympia, Oswald, etc.).

responses, I also noted important aspects of the interviews as they occurred. An example of a notation to an interview is provided in Figure 15.

Figure 15: Example interview note


* Support functions – design perspective
* Competitors –
  don't participate direct
  influence
* Agile <-> 1 or 2 in market
  - Best technology in market.
* Agile – parts of Business we are
  agile – foundation parts
  not flexible <-> consumption
  based models.
* Ent + SPs contribute & want
  to go.
  * 30 years -> not slow.
    late to the cloud + now
    catching up.

* Good at band-aid solutions on
  a case by case basis.
  * Do things reactive
  * NE off / non operational
  * Sales s.

Interviews themselves were conducted over a 10-week period commencing on the 10th October and ending on the 19th December 2014. The duration of interviews ranged from 31 minutes for executive 'Emmanuelle' to 80 minutes for operational employee 'Orlando'. The average interview duration was 51 minutes. The specific time, date, and duration of each interview is provided in Appendix 13.

I also collected background demographic information on each interview participant. In some instances this was specific; for example the number of direct reports that an interview participant had. And in other areas I collected information in ranges, such as the number of years the employee had been at Cisco, and their own age-range. I collected ranges, because some employees were unwilling to be specific on these questions but were willing to answer in a more general way. One surprising aspect uncovered in collecting such demographic information was the number of employees who had directly engaged with Cisco *prior to becoming an employee*. Indeed 20 out of 27 participants had this external perspective on Cisco.

Table 14 on the following page contains the demographic information on interview participants collected.

Table 14: Background information on interviews and participants

Participant	Years at Cisco	Number of reports	External experien ce with Cisco	Product or Services Business Model	Sex	Age Range
Eva	5-10	>1000	Y	S	M	40-50
Oran	0-5	0	N	P	M	20-30
Orlando	5-10	3	N	S	M	20-30
Orson	5-10	5	N	S	M	40-50
Olaf	5-10	3	Y	P	M	40-50
Onofredo	0-5	0	Y	S	M	30-40
Orpheus	5-10	0	Y	S	M	40-50
Osiris	5-10	11	Y	S	M	30-40
Edward	5-10	6	Y	S	M	40-50
Emmanuelle	>10	581	Y	S	M	50-60
Edwina	>10	1	Y	P	M	50-60
Elfie	>10	55	Y	P	M	40-50
Olly	>10	0	Y	P	M	40-50
Ophelia	5-10	7	Y	P	M	30-40
Ocean	5-10	10	Y	S	M	40-50
Odin	5-10	0	Y	P	M	40-50
Olga	>10	0	Y	S	M	40-50
Oli	>10	0	Y	S	F	40-50
Olympia	5-10	0	Y	P	F	40-50
Omari	>10	25	N	S	M	40-50
Orchid	0-5	2	N	P	M	20-30
Ozzy	>10	0	Y	P	F	30-40
Oswald	>10	0	Y	P	M	30-40
Otto	>10	0	N	P	M	40-50
Odysseus	>10	0	Y	P	F	40-50
Oliver	>10	52	N	S	M	40-50
Omar	0-5	2	Y	P	M	40-50

5.2 Raw data, coding, & analysis

Following transcription of each interview recording (conducted by an external agency approved by Macquarie University) I used my personal notes to address obvious gaps in the returned transcripts; for example, where unique expressions were used, or where words were slurred. The process of addressing inevitable holes in the initial

interview transcriptions enabled 390 pages of high quality interview data to be captured.

To analyse interview data, I used the data analysis software "NVIVO" (version 11), widely used in academia to analyse qualitative data. For example, according to Google Scholar, 2479 scholars have cited Bazeley & Jackson's (2013) book titled *Qualitative Data Analysis with NVIVO* and I too followed the author's technical guidance for using the program.[16] Therefore, after loading transcripts into the software and establishing a 'case node' per interviewee containing their demographic data, I coded each interview transcript. Consistent with my interpretive theoretical perspective and ethnographic methodology (please see Sections 4.2.2 & 4.2.3 for further details) I approached coding by looking for patterns and similarities in the data (Stacey, 1995). However, because this is difficult to achieve without some level of structure I loosely followed an open-coding method based on Strauss and Corbin (1998). Here, I developed a preliminary code schema based upon previously known key words (such as 'rules' 'boundaries' 'customers' etc.), contextual text search, and automatically discovered codes (using the in-built function 'auto coding wizard'). Then, using the preliminary code schema I reviewed the origination of each code reference against the original interview transcript, the audio recording, and my associated notes where necessary. This was a highly iterative process and it had the effect of significantly widening the code schema as more codes were added on each cycle of review. For example, I added 16 additional sub-codes to my original code for 'change', as follows:

- Change - decision to

[16] Search conducted on 16 January 2017.

- Change - external environment
- Change - iterative or incremental in business model
- Change - major in business model
- Change - motivation in business model
- Change - planned in business model
- Change - proactive in business model
- Change - rate in business model
- Change - reaction in business model
- Change - reaction to change in business model
- Change - reactive in business model
- Change - resistance to
- Change - static in business model
- Change - surprised in business model
- Change - time to
- Change - in business model

Once completed, my final code schema increased to number of codes from 34 to 92. Each interview was then methodically coded using the developed code schema. While this process was laborious, broad themes began to emerge as the number of references applicable to some codes grew. Upon completion, the number of references captured per code ranged from 2 to 208. I provide my final code schema and the number of references per code in Appendix 6. In Table 15, I also provide a summary of the number of codes and total number of coded references per interview participant.

Table 15: Summary of number of codes and coded references per interviewee

Participant	Number of codes	Number of references
Eva	43	110
Oran	57	164
Orlando	55	168
Orson	54	143
Olaf	63	174
Onofredo	64	233
Orpheus	67	208
Osiris	53	150
Edward	41	75
Emmanuelle	46	76
Edwina	48	137
Elfie	60	192
Olly	60	189
Ophelia	65	183
Ocean	57	166
Odin	53	141
Olga	56	129
Oli	56	161
Olympia	41	62
Omari	65	148
Orchid	49	124
Ozzy	48	85
Oswald	49	129
Otto	58	123
Odysseus	58	126
Oliver	55	138
Omar	53	158
Total	Not applicable	3892

Overall the percentage of coded references in each interview ranged from 19% to 45%. This was not unexpected – because deep contextual information was important for my interpretation of the data I opted to capture larger components of the transcript per coding instance. For example, in some cases I captured both my own interview question and a participant's response to it.

To supplement and triangulate (Flick, 2007) my primary data, I also collected a significant amount of secondary information on Cisco. In this regard, I initially assessed each potential instance for obvious accuracy and/or inaccuracy. For example at this initial 'harvesting' stage I discarded speculative estimates on what Cisco's share price may be at some date in the future. Then to narrow the amount of secondary information for subsequent analysis and to be consistent with McDonald & Eisenhardt's (2014) I focused on sources that were either generated by a *named company employee* (for example in a blog post) before then focusing on data generated by Cisco at a corporate level (for example a corporate press release). To contrast firm generated data I also focused on external information that reviewed, or analysed Cisco *in depth* (for example in financial analyst reports). This approach resulted in my discarding material that could not be attributed to a named author further narrowing the amount of information I collected for further analysis. Finally, I additionally collected and reviewed academic articles and or books on Cisco. In all, the secondary information I collected on Cisco was *high quality* and included 45 company blog posts or official releases, 24 high-quality 'investigative' articles on Cisco, and 12 public websites hosted by Cisco at www.cisco.com (and its derivatives) with a particular focus on Cisco's extensive ethics website. I also gathered 11 journal articles and/or books that assessed Cisco focusing on those that reviewed Cisco's business models.

After collating my secondary information I employed a similar approach to analysing it as I used for my primary data. First, I organised each artefact into the following categories: business model, firm or firm performance, competitor activity, external analysis or observation, firm or employee announcement, and other. I then analysed each artefact in depth. This was a detailed assessment and I used the code schema

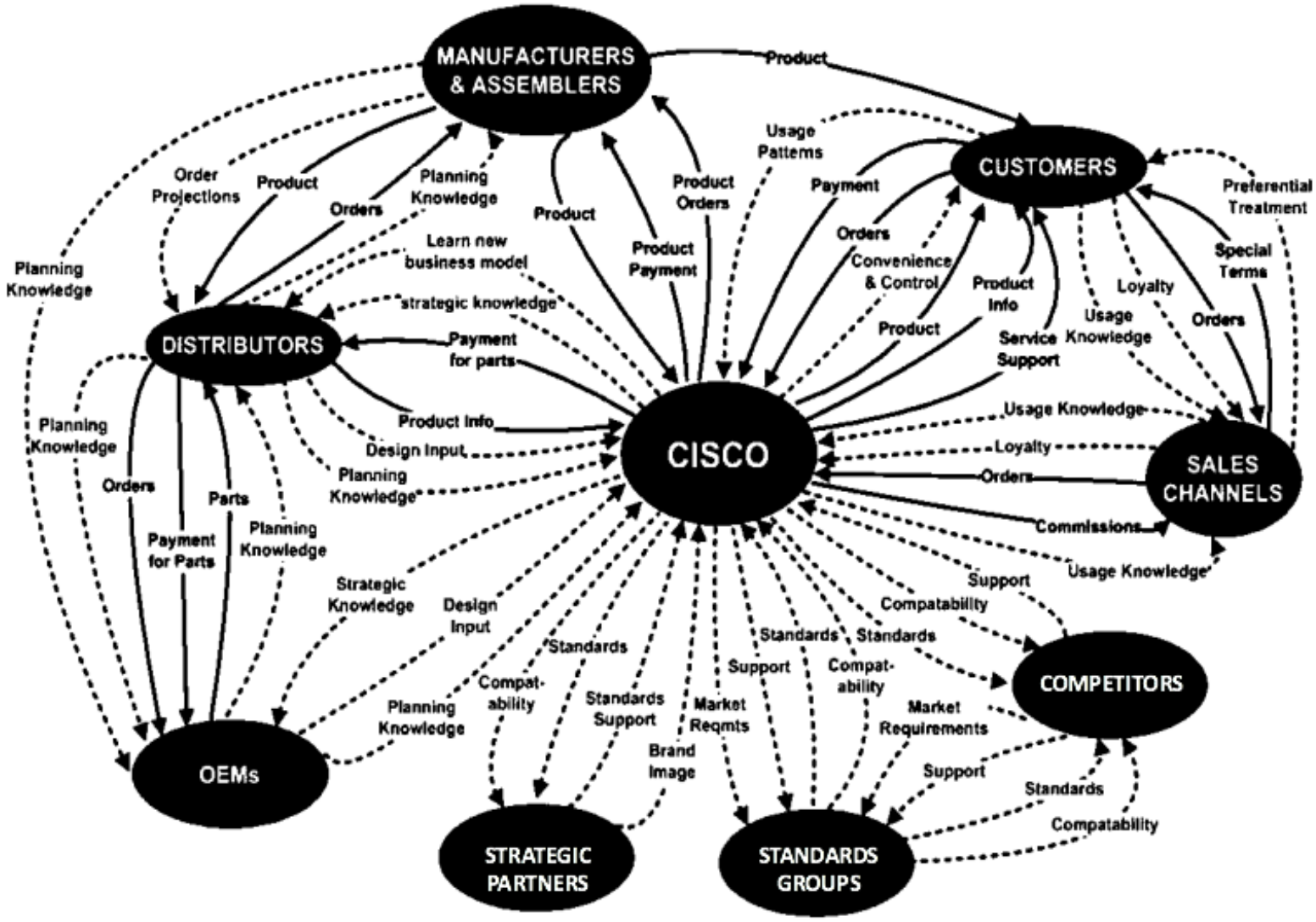
outlined in Appendix 6 to help analyse the information. Specifically I associated each artefact (or sub-part) with appropriate codes. Interestingly and unlike my primary data analysis, I found this analysis substantially easier because a lot of the secondary information had already been categorised by its originator under clear headings or headlines (e.g. articles in press). Finally, when making an association I also made my own notations about how or why the secondary information source related to the code.

Therefore in both organising and analysing my primary and secondary data I used an interpretive lens and looked for patterns and relationships (Stacey, 2007) in the data. Ultimately, I followed Miles et al.'s (2013) guidance that qualitative data itself analysis can be likened to the process of completing a jigsaw where the pieces of the jigsaw must be first sorted into something *meaningful to the researcher* before a picture can be created. Finally, consistent with conducting research *in practice* at each stage of my analysis I spent significant time *reflecting* and generally thinking about my data, approach, and analysis (Simons, 2009).

5.3 Cisco's business models

To comprehensively define Cisco's business models, I followed the two-step process outlined in Section 4.3.3 of Chapter 4. First, using Porter's (1996) activity system framework, I developed an initial representation of each business model in the scope of my case study. I then discussed the draft representations with each interview participant to gain their feedback on them. Due to the unexpected complexity and overall scope of each business model one secondary artefact I leveraged heavily was the value map of Cisco's overall business (Allee, 2003), as per Figure 16.

Figure 16: Cisco – value map



Source: Allee (2003).

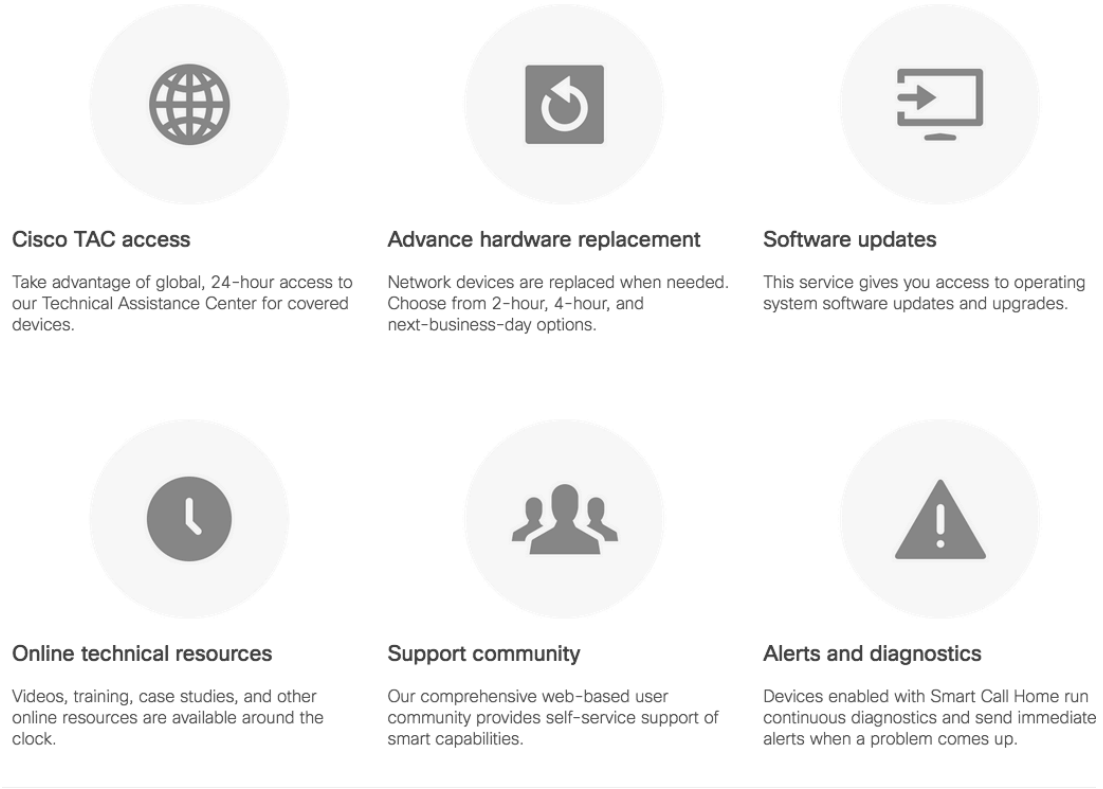
Allee's (2003) value map is the only comprehensive description of Cisco's business activities I was able to identify. It includes both tangible deliverables (represented by unbroken lines) and intangible deliverables (represented by dashed lines) associated with Cisco's business. Importantly, it also includes deliverables from both Cisco's Product and Services business model(s). For example, 'product' and separately 'service support' are listed as "tangible deliverables" (Allee, 2003: p.3) that Cisco provides to its customers. Interestingly, in the case of 'products', Allee indicates these are provided to Cisco's customers both directly by Cisco itself and indirectly by Cisco's 'manufacturers and assemblers'. In turn, this highlights just how deeply Cisco's external partners are involved with its business activities – almost to the extent they are indistinguishable from Cisco itself (from Cisco's customers' perspective).

A further important secondary data source used in providing my initial drafts of Cisco's business models were Cisco's 2010-2016 annual reports. In these reports, Cisco provides a wealth of information and they are specific in many instances about important elements included in their business model(s). For example, in the Cisco's 'letter to shareholders' accompanying its 2015 annual report, Cisco's chairman John Chambers specifically highlights the importance of Cisco leading 'market transitions', a theme often repeated in Cisco collateral and a key indicator that Cisco understands the importance of being able to respond to market feedback, a point I further address in the Section 6.1.4 of the following chapter:

> At Cisco, we believe much of our success of has come from our ability to lead market transitions (Chambers, 2015a: p.1).

Related to the public disclosures Cisco makes to its shareholders, Cisco also provides a significant amount of information on its website about its business models, value propositions, activities, and deliverables. For example, when researching the Cisco Services business model, I found key service support deliverables clearly outlined and expressed under the service description section of Cisco's website. I provide these deliverables in Figure 17.

Figure 17: Cisco's support deliverables



Source: http://www.cisco.com/c/en/us/services/support/smart-net-total-care.html [Accessed 18 January 2017].

In combination with the secondary data I collated, my draft representation of each business model, and then my subsequent discussions with each interview participant, I provide the *final* versions of the Cisco Product and Services business

models in Figure 20 and Figure 22 in landscape format on pages 149 & 151 of this chapter respectively.[17]

5.3.1 Cisco Product business model

Cisco's Product business model as represented in Figure 20 is constituted by a mix of *resources, activities, effects* (outcomes), *relationships* (linkages). In combination these elements form *feedback loops* that are significant to the business model because they enables it to function over time. Importantly, the business model also delivers multiple outcomes; some of which benefit the firm and others that benefit other stakeholders of the business model. For example the outcomes of *"add value to Cisco's products*" and *"build long term customer relationships"* means the business model functions in accordance with my definition for a business model as it can be considered to *create, deliver, and capture value.*

While the business model covers Cisco's entire portfolio of products each of which is at a different stage of its lifecycle, a useful way to analyse the business model is to use an illustrative journey for an entirely new product being developed by Cisco. This illustrative journey is represented in Figure 21, pieced together from a number of examples provided by participants when describing how the business model worked *in practice*. However, this illustrative journey is simplified and it is only one of many pathways a product may follow in the overall Cisco Product business model system.

The first step in the journey represented by step '1' in Figure 21 is Cisco conducting '*exhaustive market and competitive research'*. In this step Cisco must identify which

[17] I emphasise that these representations are specific to Cisco itself and include a mix of descriptions that are practitioner specific. This is because interviewees were encouraged to openly describe the business model without regard to structuring their descriptions in any one way or another.

technology it believes its customers will demand, *in the future*. For firms in the high-technology sector this is a significant challenge and the format war between Betamax and VHS provides an indication of the type of consequence Cisco's choices and decisions in this step have. Furthermore, once a high-level technology decision has been made Cisco must also determine the key features and characteristics required in the product itself; for example the size and capability of its processor chip, the amount of memory it needs, its expected price, and so on.

Once the direction for the product is understood Cisco then must move to step '2' by making an investment in its development. In Cisco's case, such an investment may range from tens to hundreds of millions of dollars for a single new product design. To represent the scale of investment made through the Cisco Product business model Cisco spent $6b USD on research and development activities in 2016 (Cisco Investor Relations, 2016: p.2). For its significant investment(s) Cisco's ultimate ambition in step '3' is to develop a *'highly featured product that is difficult to replicate'*. Interestingly, this step represents Arthur's (1998: p.103) observation that firms operating in the high-technology sector can 'lock-out' competition through the barrier of "high up-front costs"; this is certainly true for products that are 'successful' but for products that are not successful the investment can be totally lost (a point I return to below).

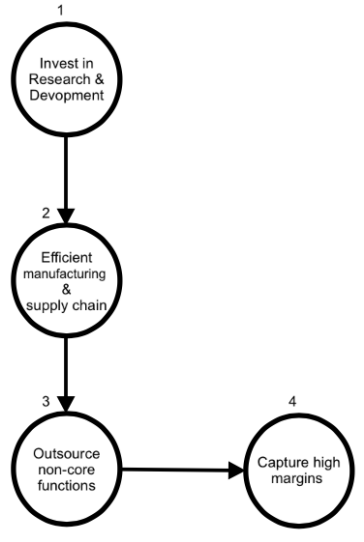
Once fully developed and launched, Cisco's *'motivated and professional sales force'* engage with potential customers in step '4' and seek to '*add value to Cisco's products'* in step '5'. Value itself is added through the sales force understanding customer requirements and developing an overall value proposition for the product

that is compelling to a customer. Examples provided by interview participants for adding value included adjusting product features being offered, lowering the price, technically demonstrating the products functionality, or offering an alternative (Cisco) product option (usually from the same product family).

One interesting aspect of Cisco's Product business model is represented in step '6' – that being Cisco aims to develop '*long-term customer relationships'.* This relationship obviously extends beyond one single product and interacts with step '7' of '*influence [customer] buying preferences'.* Simply stated if value was not being added then Cisco would not be able to influence its customers buying choices. Naturally, the outcome expected in step '7' is for Cisco to convince its customers to buy the recently product launched in step '4'. Critically, as a '*highly featured product that is difficult to replicate'* Cisco prices its products at a premium and it is through premium that Cisco is able to *'capture high margins'* outlined in step '8'.

provides a second example for an illustrative product journey in the business model. This product journey also enables Cisco to *'capture high margins'* (step '4'). However, in this example, Cisco lowers its cost base through its key resource of operating a highly *'efficient manufacturing & supply chain'* (step '2') and through the activity of *'outsourcing non-core functions'* (step '3'). For clarification, in developing a new product new manufacturing capability may also be required as an investment in step '1'; for example a new manufacturing plant or process may be required.

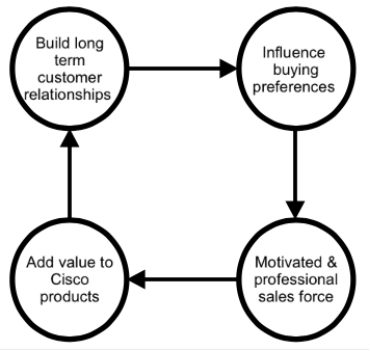
Figure 18: Illustrative product journey through Cisco Product business model – example two



The ability to *'capture high margins'* also highlights the presence of a significant *feedback loop* in Cisco's Product business model. In simple terms, without generating high margins Cisco would not be able to fund necessary research and development investments required for the business model to launch new products and therefore sustain itself over time. Indeed this is significant because some investments may *not lead to success;* the business model must therefore sustain both successful investments and products that do not achieve their sales ambitions.

A further feedback loop is furthermore evident in description I have given for how Cisco influences its customers to buy its products. This feedback loop is diagrammatically represented in Figure 19.

Figure 19: Customer feedback loop in Cisco Product business model



Yet another feedback loop also exists between the components *'invest in research & development', 'shorten product development cycles'*, *'lead market and technology transitions'* (e.g. to a new technology standard), and *'capture high margins'*.

A fascinating finding identified by assessing the feedback loops in the Product business model was the sheer number of elements contained in the overall business model system. It is made up of a very large number of contingent and mutually reinforcing linkages that connect the business model together and enable it to function as a *coherent whole*. On analysing these relationships and their multiple connection points, it is clear that removing even a single linkage would represent a significantly detrimental impact on the way the business model functions. For example, if the element *'Cisco branding & marketing activities'* is decoupled from '*building long term customer relationships'* – this outcome may be threatened or at least be significantly harder to achieve; in turn other related elements of the business model will be similarly impacted.

It is therefore highly likely that the overall complexity of the business model itself means it cannot be easily replicated by a competitor and if so this complexity represents a further way the Product business model is able to the generate

increasing returns that Arthur (1996) associates with mechanisms positive feedback in a complex adaptive system. In Section 6.1.4, I discuss the overall importance of feedback loops in a complex adaptive business model.

However a confusing and counterintuitive finding was that participants did *not* specifically identify *'generating revenue'* as a core element of the business model. This was surprising because the revenue generated is significant. It is possible this perspective aligns with the notion that the creation of 'value' in a business model may be both monetary and/or non-monetary and it is therefore significant that *'building long term relationships'* and *'influence buying preferences'* directly relate to this outcome but were described as *effects* of the business model, rather than activities themselves. I discuss how the concept of value is impacted with the notion of a complex adaptive business model in Section 6.2 because it is a *fundamental challenge* to the underlying assumption in the mainstream perspective on business models that collecting value means that 'revenue maximisation' for the firm alone.

The likely size of the extended ecosystem surrounding Cisco's Product business model that is required to perform activities that enable $37.2 billion dollars in annual revenue to be generated (see Figure 13) was also not discussed in any detail by any of the interview participants. This is significant because many key resources and activities in the Product business model are not provided solely or even in majority by the firm. Instead they are provided in close collaboration with an extended ecosystem of interconnected participants. For example, Cisco's product business unit(s) embed external product components into developed products and this achieved through third party license arrangements, investments, acquisitions, and resale agreements.

Indeed while unquantifiable the size of the overall collaboration network must be extensive.

Nevertheless, a large extended network of business model participants *is expected* because as identified in Section 2.3.1, Chesbrough (2012) has emphasised that in the high-technology sector successful firms such as Cisco must rely on such a large external network of participants in order to offset short product life cycles and high development costs. It was therefore significant that participants did not mention this. Possibly this is because external participants are simply seen as part of the business model itself and are not perceived separately from the firm.

5.3.2 Cisco Services business model

Cisco Services business model is provided in Figure 22. Similar to the Cisco's Product business model, the Services business model is also constituted by a mix of *resources*, *activities*, *effects*, *relationships*, and *feedback loops*. Notably the Services business model also operates to deliver substantially similar outcomes – to deliver *'high quality [services] at high margins',* to *'build long-term relationships',* and to generate *'unique services that are hard to replicate'*. To achieve these outcomes the business model locates its own (but different) resources, performs its activities, and ultimately creates its value within an extended ecosystem of participants (Schumpeter, 1936) thereby also closely aligning with the *evolutionary perspective* on business models I have outlined in Section 2.3.

Using an illustrative new service launch also provides a useful way of analysing the Services business model. This illustrative service journey is provided in Figure 23. It highlights, that similar to the Product business model, an initial investment in

'developing new services and capabilities' is required in step '1' with the ambition of *'offering unique services that are difficult to replicate'* in step '2'. In step '3' the developed service can be offered to a large pre-existing number of customers that have already installed Cisco's. Here there appears to be a counterintuitive motivation for a customer to buy a new Cisco service – because it is likely to help *increase the value* provided by the original product purchasing decision. For example, Cisco Services offers a 'network optimisation service' that ensures all Cisco products installed by a customer operate efficiently.[18] Furthermore, because products (including those modified by customisation service) do fail on occasion (e.g. their electronics cease to function) this pre-existing customer base is also likely to need a support service that is provided through Cisco's technical service department. This is outlined in step '4'. In step '5' to build *'long-term relationships'* with Cisco services customers (who may be different individuals to those who made the product purchasing decision) all services must be delivered at '*high quality'* and if so will *'capture high margins'* as outlined in step '6'. This is because unlike products, services can be replicated at a low unit cost (e.g. by sharing intellectual property virtually, or providing 'remote' services from a centralised location).

Step '7' in the illustrative service journey demonstrates that the Cisco Services business model contains *feedback loops* similar to the Product business model. Here the delivery of the services contributes directly to *'Cisco experience & knowledge'*. Continuously adding experience and knowledge clearly helps Cisco develop new services that may be attractive to its customers.

[18] Further details on this service can be found at:
https://www.cisco.com/c/en/us/services/optimization.html#~stickynav=1

The mentioned feedback loop is not the only feedback loop in the Services business model. For example, while not as visible to that in the Product business model another feedback loop exists between *'building long-term relationships'*, *'delivering high quality services at high margins'* and Cisco's *'motivated and professional sales force'*.

Finally, also similar to the Product business model, is the overall complexity of the Services business model and the extensive number of relational linkages between the components. The likely impact of removing a linkage between one or more elements of the Services business model has the same effect; its operational coherence is threatened.

5.3.3 Contrasting Cisco's business models

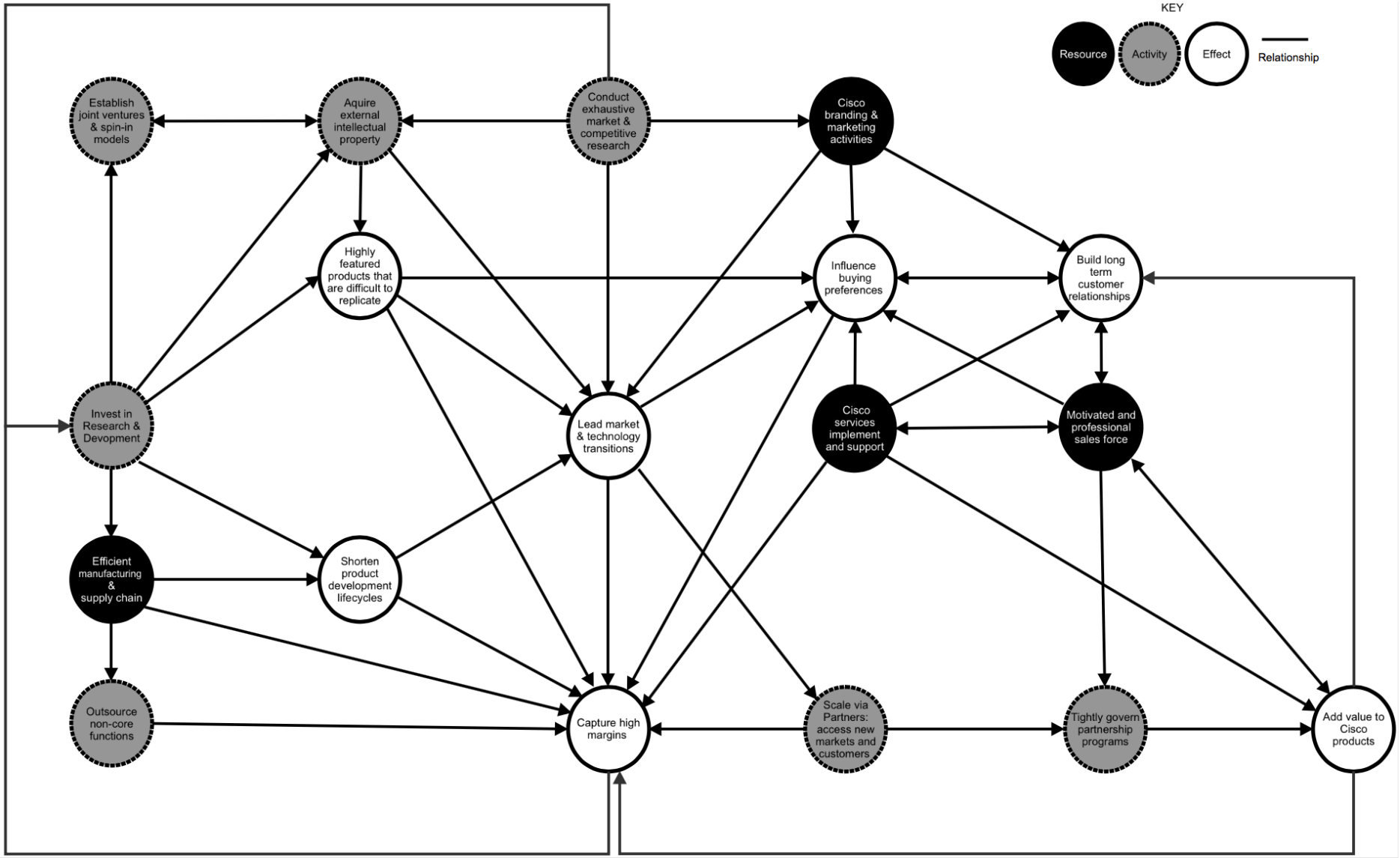
The similarities between the two business models raise the question about whether they are part of the same whole: a single Cisco 'meta business model'. Here, notwithstanding the many similarities, they are different in two crucial areas. Most significantly they provide very different things to their customers: the Product business model, delivers *tangible* items and the Services business model delivers *intangible* items. This is a *fundamental difference* because it means the two business models operate in separate (but connected) economic sub-spaces. Simply stated, customers have separate purchasing drivers for engaging with each business model – and the two business models have different external competition and market expectations. Customers too are often different – even when the same external firm is involved; different individuals are often engaged in procuring a Cisco product than those procuring a Cisco service. For example an engineering department may be

Cisco's product 'customer' versus an operational department procuring Cisco's services.

In addition, it is also significant that Services business model is managed and operated by a predominantly *separate organisational division* to that operating the Product business model – Cisco Services. This is significant because Cisco Services has a separate reporting hierarchy, KPI and incentive structures, business units, its own IT support division and so on. Indeed, the two organisational divisions have their own independent hierarchies and span multiple parallel organisational levels only connecting at the very highest point in the firm (the chief executive).

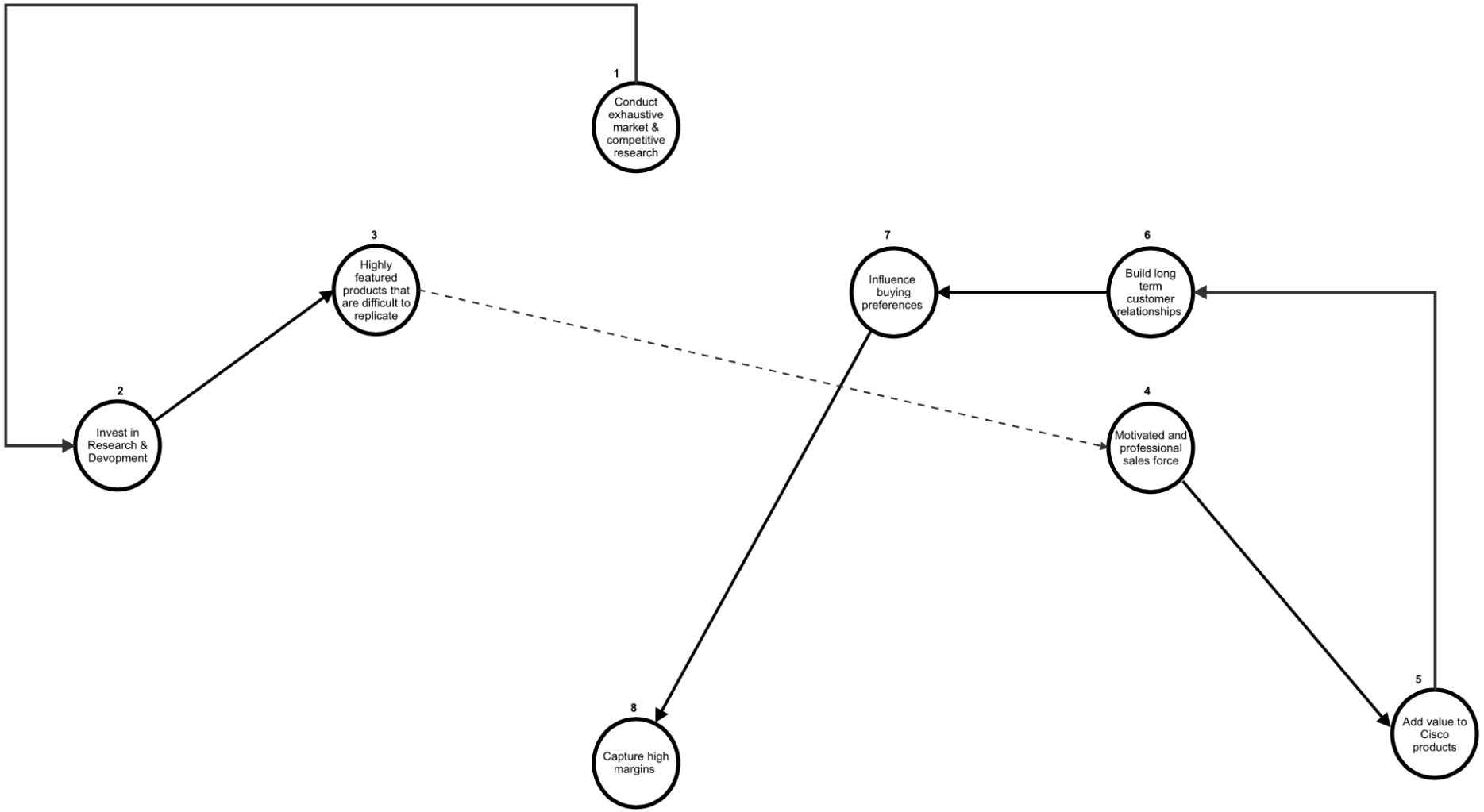
Therefore in combination with these two significant differences, the two business models can be conceived as siblings – in effect they operate in parallel and each spans multiple but predominantly separate organisational layers. Here, Markides & Charitou, 2004 identify many organisations are challenged managing two different business models because of the chance their underlying value chains can conflict. In contrast it appears that *Cisco's two major business models interact and mutually reinforce the other*. This is possibly because the separation between the two divisions is not absolute as would be in a conglomerate organisation. For example, a key area of overlap between the two business models exists in Cisco's sales force (another separate organisational division in Cisco) and it likely through this avenue that *'building long terms relationships'* is achieved in both business models and likely reduces the friction between the two business models in the sales cycle.

Figure 20: Cisco Product business model



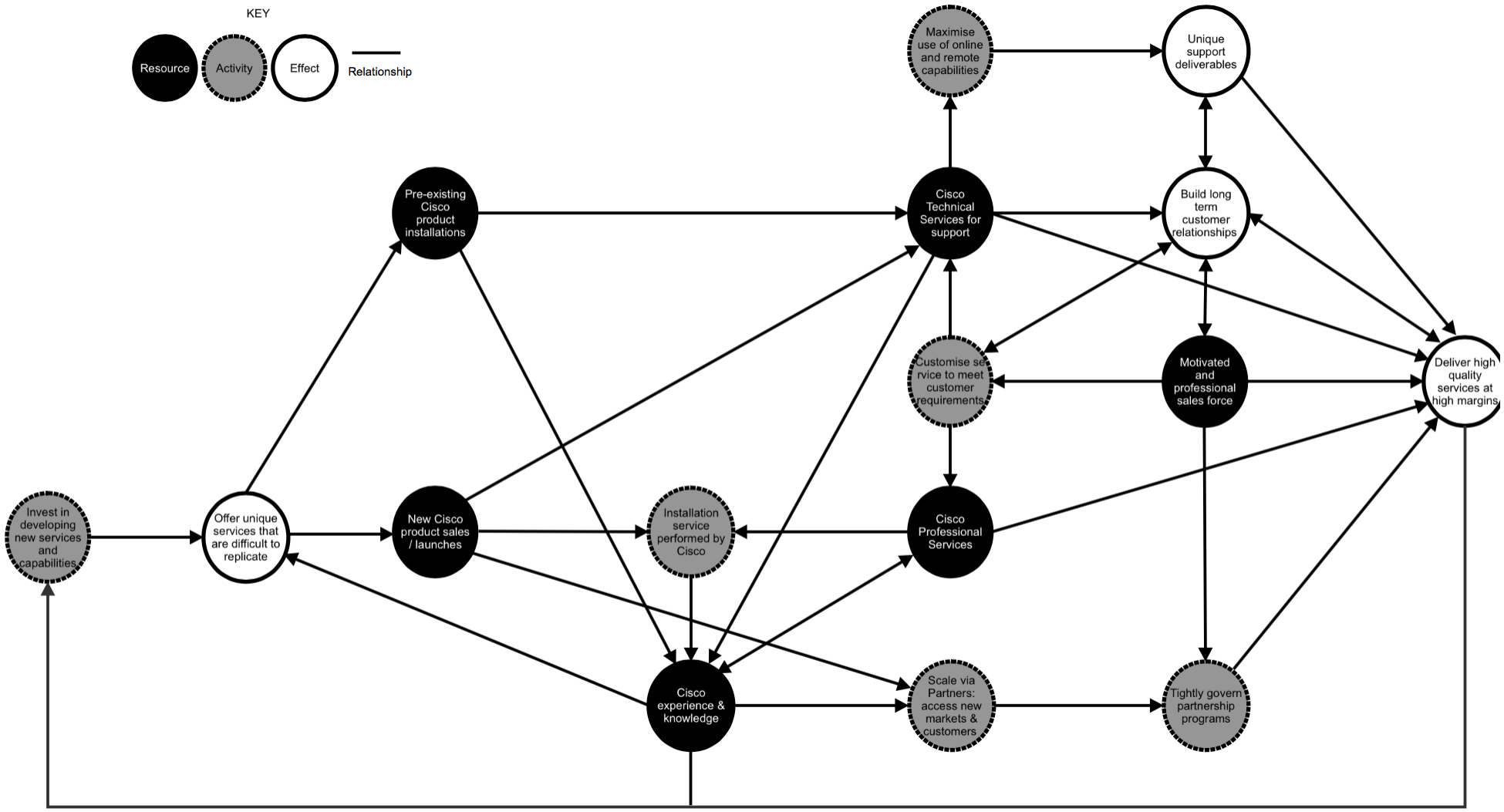
Source: author with interview participant feedback

Figure 21: Illustrative product journey through Cisco Product business model – example one



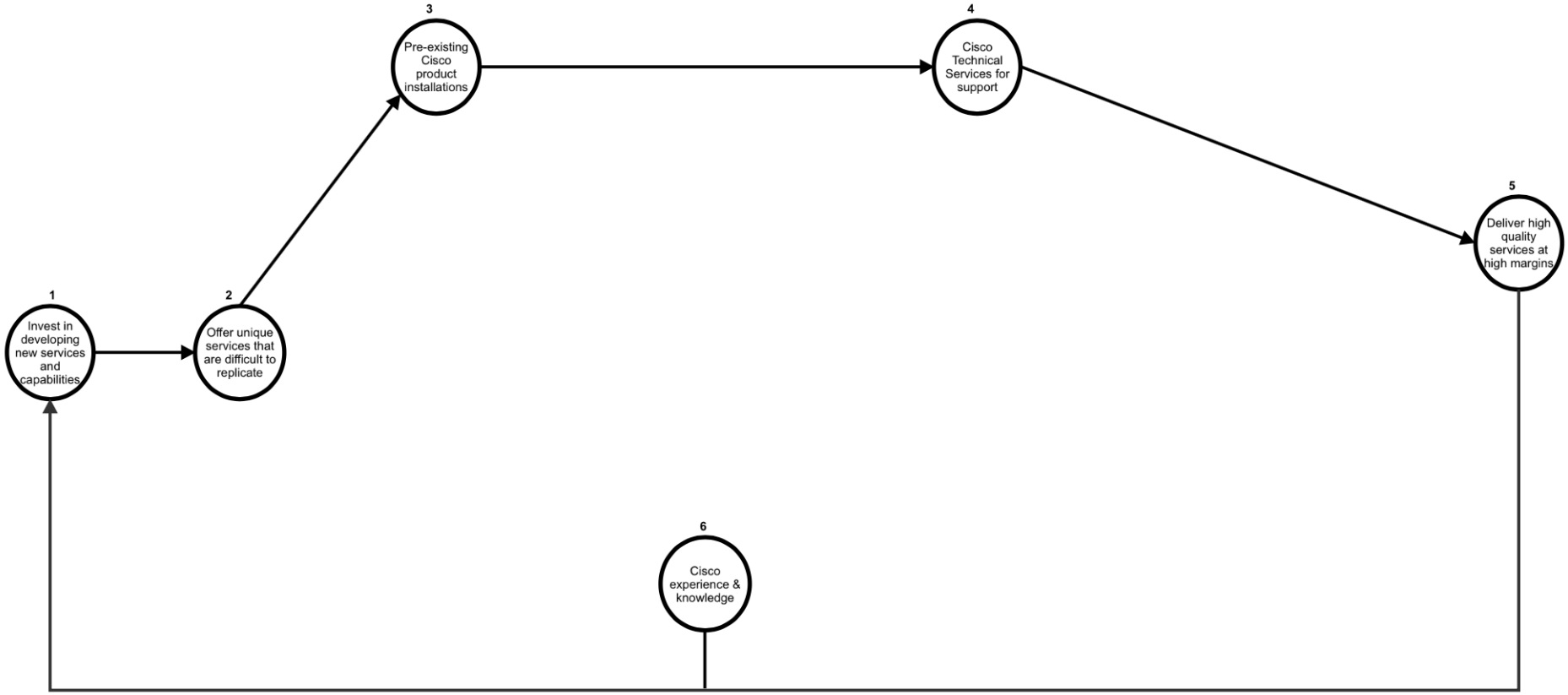
Source: author

Figure 22: Cisco Services business model



Source: author with interview participant feedback

Figure 23: Illustrative service journey through Cisco Services business model



Source: author

5.4 Supporting research questions

In this section, results applicable to each of my supporting research questions are provided. I have mostly combined results separately attributable to the Cisco Product and Services business models and therefore refer in the singular to the 'business model'. I have combined my results because, for the most part, no significant or material difference in participant responses from my interviews was evident. Moreover, interview participants themselves typically referred to 'the business model' even when discussing each one separately. Nevertheless, in the two cases where I do identify a potentially significant difference, I have outlined and highlighted it as appropriate in the containing sub-section.

5.4.1 Rules

What rules and guidelines are identifiable in the business model?

Rules themselves, inclusive of sub-categories of rules such as guidelines, policies, laws, and regulations, were clearly evident in the business model. Specifically, 24 of the 27 participants identified a specific rule or multiple rules in their interviews. Only three participants indicated rules were not present in the business model or disclosed that they did not follow any rules in engaging with the business model. Of these respondents, two were operational-level employees and one was a senior executive. Interview results also indicate a slight skew towards operational-level employees identifying rules by their name. In essence the more senior the participant, the fewer rules they were able to identify and the specificity of their descriptions of the rule(s) decreased.

To highlight the similarity of results between the Cisco Product and Services business models, the number of interview participants identifying that rules existed in each business model was the same as I have indicated in Table 16. In the same table, I have also included the three participants who indicated that no rules existed in the respective business model.

Table 16: Participants identifying rules compared with business model

	Product Business Model	**Services Business Model**	**Total Sources**
Identifies rule(s) exists	12	12	24
Identifies rule(s) do not exist	2	1	3

The largest sub-category of rules identified by participants was related to formal Cisco policies. In this sub-category, four discrete areas were identifiable:

1. Legal and financial
2. Ethical
3. Human resources
4. Other

In each area, the following policies were identified by name by at least three interview participants as highlighted in Table 17:

Table 17: Policies categorised by area, identified by interviewees

Financial & Legal	Ethical	Human Resources	Other
Bookings policy	Code of business conduct policy	Human resources policies	Travel and expense policy
Non-standard deal policy	Risky business policy	Hiring policy	Compliance policies (e.g. electrical)
General laws & regulations			Manufacturing policies
Shareholding policies			Partner programs
			Occupational safety & health policies

Broadly, interview participants acknowledged the applicability of these policies in the context of the business model with the following quote being representative:

> There's five or six key policies there that drives things like what levels of risk we can take (Olympia).

Interestingly, notwithstanding that several policies or rules were specifically named by interview participants, a clear identification problem was also evident. While the majority of participants knew the policies (and thus, rules) existed, they were unable to articulate how they found out they existed or where to locate them. This is neatly summarised in the following quote:

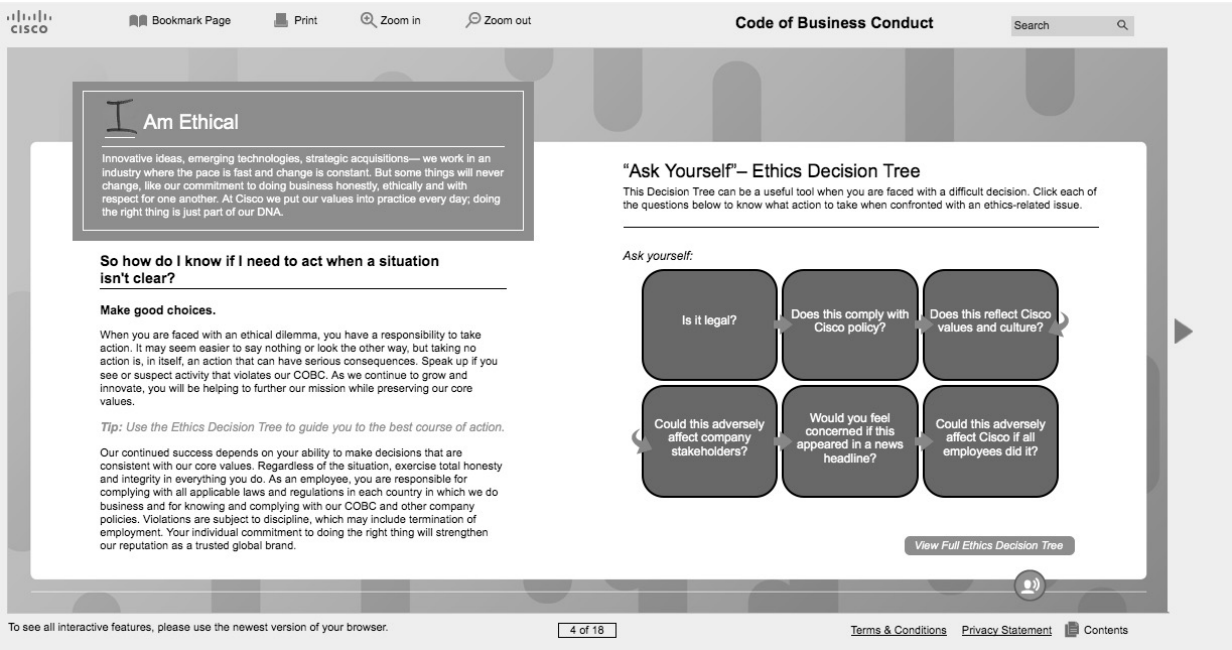
> The interesting thing is you don't naturally get inducted into the organisation, go straight to those policies and go, ‘Right. Here's our – here are the things that define how the business works’ (Elfie).

Nevertheless, by referring to the policies identified by participants in Table 17 and referring to supporting information I was able to identify the following *high-level* rules apply to the business model:

1. Make good choices.
2. Follow the law.
3. Act ethically.
4. Always do the right thing by the customer.
5. Make it profitable

One important source of supporting secondary information that assisted in confirming the list of business model rules highlighted above, was Cisco's 'code of business conduct policy'. This is a set of principles set out by the company (and is publicly available on Cisco's website) and where employee compliance is managed closely (Cisco reports the percentage of employees who have completed the compliance process annually). Figure 24 contains a representation of the ethical decision tree included as part of Cisco's code of business conduct policy that also *highlights the business model rule 'make good choices'*.

Figure 24: Extract from Cisco code of business conduct



Source: http://www.cisco.com/c/dam/assets/about/ethics/cobc/ebook/2015/page/04-i-am-ethical.html [Accessed 18 January 2017].

The importance of Cisco's code of business conduct, and, more broadly the importance of Cisco's culture in following business model rules, was highlighted by 14 out of the 27 interview participants. The following quotation highlights the way culture operates to enforce business model rules:

> I suppose by following those organisational guidelines, we might not be able to recite them off the top of our heads, but it comes back down to culture and behaviour, which you get into your DNA ultimately, because you know what guidelines to follow, and what behaviours to not follow. I think that comes back to the culture of the organisation (Otto).

I discuss the interrelationship between culture and the ability for a firm to operate a complex adaptive business model in Section 6.4.1 below and I highlight that achieving this is a challenge for many organisations. However, in Cisco its culture

seems to lend itself to the notion. For example, a secondary source of information I leveraged and that also highlights the interrelationship between culture and business model rules, was Cisco employee badges. These badges are given out annually to all employees to wear along with their local building security passes. The badges include key information about Cisco's vision, strategy, and culture. Examples are provided from Figure 25 to Figure 28 below. Specifically, Figure 25 & Figure 26 *highlight the rule 'make it profitable'* by referring to the company desire to 'grow profits faster than revenues' while Figure 27 *supports the rule 'do the right thing by the customer'* by highlighting the core value in Cisco of focusing 'intensely' on its customers. Interestingly, Figure 27 also supports the business model component identified in the product business model of 'leading market transitions'.

Figure 25: Cisco employee badge 2014 – company goals

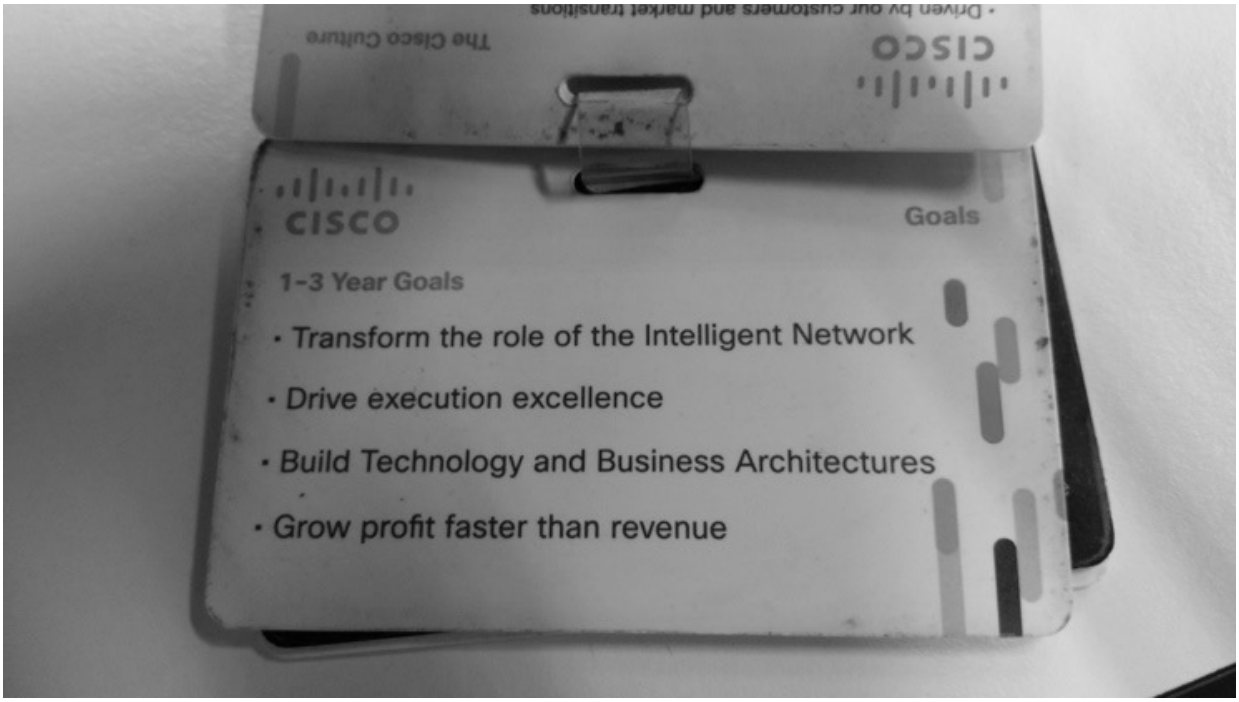


Figure 26: Cisco employee badge 2014 – company initiatives

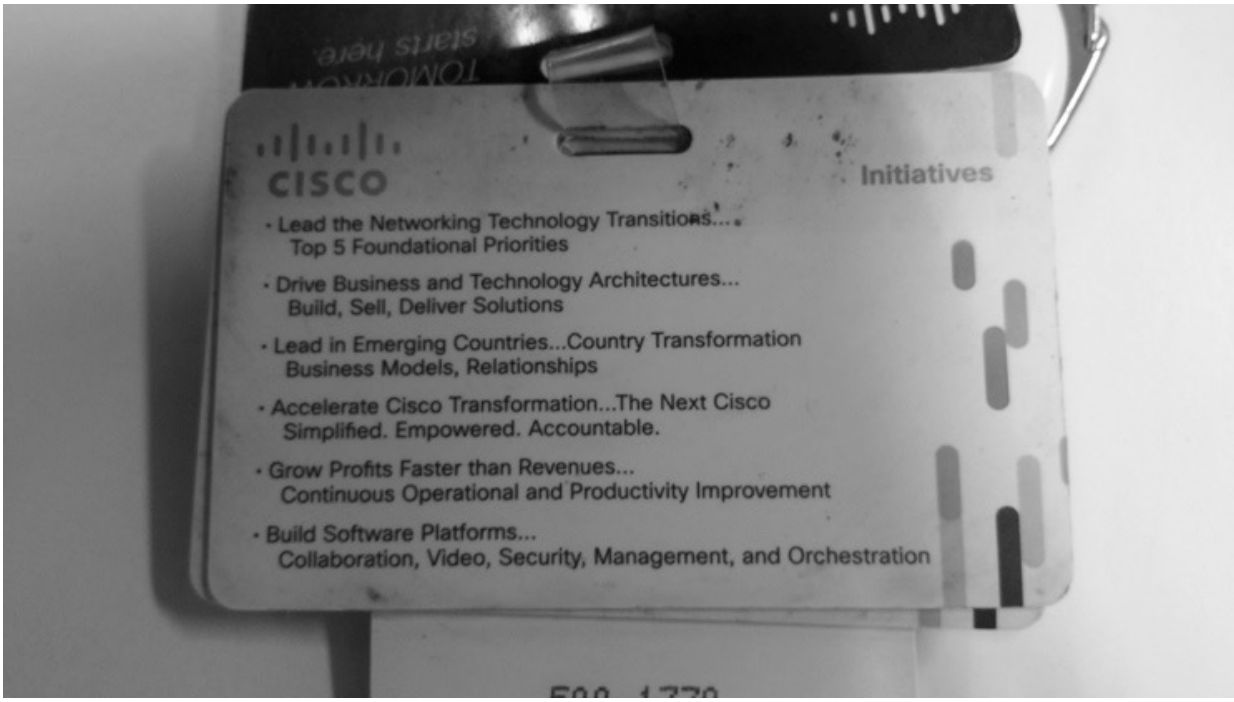


Figure 27: Cisco employee badge 2014 – company culture

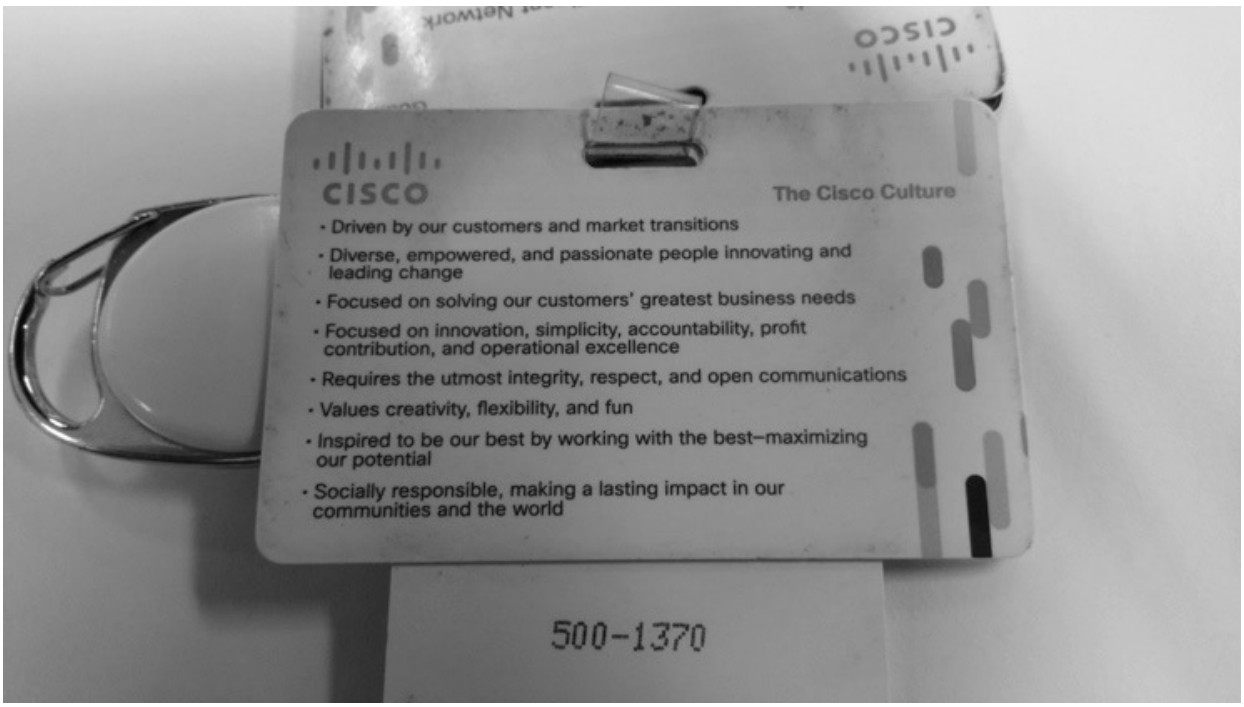


Figure 28: Cisco employee badge 2015 – company values

Ultimately, both primary interview data and the secondary information referenced indicate a strong presence of rules in Cisco's business model as indicated by the following quotation:

> It doesn't matter if small or big, as long as it's within the law, within the legislation, within the rules, then we have to abide by [them] (Olly).

However, the absolute *following of the rules*, as indicated by the above quote, was not supported broadly by interview results. On assessing whether participants actually followed rules in their day-to-day engagement with the business model, only eight participants indicated they followed but *did not break* business model rules. In contrast, the majority – 17 participants[19] – indicated they both follow and also *break*

[19] One participant was removed from this assessment due to contradictory statements regarding the applicability of rules to the business model

rules in their day-to-day roles. The matrix provided in Table 18 summarises this finding:

Table 18: Matrix comparison of participants following or breaking rules

Participant identifier	Follows and does not break rules	Follows and breaks rules	Does not follow and breaks rules
Eva	Yes		
Oran	Yes		
Orlando	Yes		
Orson	Yes		
Olaf	Yes		
Onofredo	Yes		
Orpheus	Yes		
Osiris	Yes		
Edward		Yes	
Emmanuelle		Yes	
Edwina		Yes	
Elfie		Yes	
Olly		Yes	
Ophelia		Yes	
Ocean		Yes	
Odin		Yes	
Olga		Yes	
Oli		Yes	
Olympia		Yes	
Omari		Yes	
Orchid		Yes	
Ozzy		Yes	
Oswald		Yes	
Otto		Yes	
Odysseus		Yes	
Oliver			Yes
Omar	Removed	Removed	Removed
Total	8	17	1

Table 18 above also highlights a skew towards both operational-level and executive-level employees (denoted by names starting with “E”) following, but also breaking rules, when engaging with the business model. Indeed, a number of participants directly commented on the necessity of breaking rules to achieve business model

outcomes in their day-to-day roles. The following two quotes best summarise this finding:

> I think it would be impossible for an individual to understand absolutely every single process or operating business model. That would be just crazy. There's no way you'd do [it] – what I think would be important is for you to understand what the model is, so you can actually find out where the flexibility is, or how many rules you can actually break without really breaking a lot (Ozzy).

> It's like a big rubber band; you can stretch it in different directions. The further you stretch it from its centre point, the stronger the resistance is, and the harsher the snap-back is that eventually occurs. However, what I've found with Cisco in my time, especially in the more recent years, is that you can stretch it to a new shape and have it retain that shape (Orchid).

One moderating finding when assessing the rigidity of Cisco's rules and participant adherence to them was the existence of an approval process for getting exceptions to many rules. Here, six participants mentioned the existence of a process that enabled them to break rules with corporate approval. It is for this reason that after reviewing the statements made by Oliver who stated they did not follow but broke business model rule (also contained in Table 18) the result was retained instead of being discarded as an outlier.

In summary, rules are clearly present in Cisco's business models and are predominantly conceived as Cisco's policies. Five high-level rules are identifiable and are reinforced by Cisco's corporate culture. However, a majority of business model

participants also indicated that while they follow they also break rules when engaging with the business model. It is likely breaking of rules in the business model is facilitated by the design of the business model itself through the existence of an approval path for 'rule breaking'. Finally, to further support these results, I provide selected additional data generated by my in-depth interviews for 'rules' in Appendix 7.

5.4.2 Boundaries

What boundaries are identifiable in the business model?

Similar to rules, boundaries were clearly evident in the business model. Across all interviews, there were 52 separate mentions or discussions of business model boundaries by 16 different participants. Of these, 12 participants were able to identify a specific boundary by name. Only one participant indicated no boundaries existed in the business model – this was the same individual who indicated no rules existed in the business model. Boundaries were identified in the form of restrictions, hard lines, barriers, or other limits faced by participants in their day-to-day operational activities associated with their respective business model.

Unlike the rules category discussed above, a slight skew was found for boundaries being present in the Services business model compared with the Product business model, although this skew was not significant enough to warrant deeper assessment. The same trend of operational-level employees, identifying more rules and describing them with a greater level of specificity, was found in the identification and description of boundaries.

Boundaries were found to exist in three separate categories:

1. Legal and financial.
2. Organisational.
3. Customer and external.

In each of the above, the following boundaries were identified by name from the interview data as highlighted in Table 19 below.

Table 19: Boundaries categorised by area, identified by interviewees

Financial & legal	**Organisational**	**Customer & External**
Profitability	Sales commissions	Customer forecasts
Government policy	Senior management decisions	Customer specifications
Laws	**Internal Inertia**	Contractual terms
Regulations	**Products & Services available to sell**	Customer budgets
Internal funding	Back end business processes	
Financial year limits	Organisational structure	
Shareholder returns		

In the above table, the boundaries identified in bold were mentioned by three or more participants. In assessing boundaries, it is of note that in the financial and legal area the boundaries identified have a direct relationship with the many rules or policies previously discussed. For example, the boundaries *'profitability'* and *'shareholder returns'* align with the rule *'make it profitable'* and the boundaries of *'laws'* and *'regulations'* align with the rule *'follow the law'*. Boundaries in the financial and legal category area were also expressed by interviewees as more absolute. The following quote on shareholder returns is instructive:

> We’re a publicly listed company and there are shareholders looking for a return, and they’re looking at a return on fundamentals. You basically can’t f**k with that (Eva).

An underlying friction appeared to exist between the *rule ‘always do the right thing by the customer’* and many identified boundaries, particularly those in the organisational area (i.e. internal to Cisco). Indeed, and similar to employees self-reporting their breaking of rules, in the case of organisational boundaries, an expectation was identified in executive-level participants that boundaries should be tested, as represented by the following quote:

> I think that’s an important part of our sales force; to get them to go outside the traditional boundaries so that we can innovate and do different things and then say, Okay, well if this currently doesn’t fit, what will? What do we need to do to make it happen? (Elfie).

The expectation that boundaries were there to be tested was also found in the operational-level employees; here seven participants specifically acknowledged this expectation although of these, with four highlighting the practical difficulties faced in testing or breaking through the boundaries and the personal cost(s) this involved:

> I feel that we do have significant discretion to implement what we need but straying much beyond the boundaries of what is available to us means significant additional workload (Olga).

Breaking through external barriers was not specifically mentioned by any participant, however, I observed that many participants believed the function of the sales force is to address many of barriers which are potentially manipulable (such as customers

having lack of budget). In Section 6.1.2, I discuss how boundaries in a complex adaptive business model regularly change. In Cisco this can be achieved, for example, by leveraging Cisco's process for breaking rules mentioned above. I also identify that even external boundaries that are perceived as 'immovable' can actually change significantly over time, for example when a new law or regulation is implemented.

In summary, results indicate that boundaries are clearly identifiable in Cisco's business models. Financial and legal boundaries align with rules identified in Section 5.4.1 and were described as more immovable than organisational boundaries. Executive-level employees indicated an expectation that boundaries should be tested which operational-level employees supported whilst also highlighting the practical personal effort this involves. Finally, to further support these results, I provide selected additional data generated by my in-depth interviews for 'boundaries' in Appendix 8.

5.4.3 Agents

How does the business model empower its participants to make decisions?

When making a decision to change an activity associated with the business model, 24 out of 27 participants described and/or discussed the importance of *decision empowerment*. Further, when asked separately about their own personal ability to make changes or decisions regarding the business model, 20 participants indicated they felt positively empowered to do so. Only seven participants indicated they felt restricted in their decision-making ability.

Of the 20 participants indicating positive personal decision empowerment, no discernible difference between participants in either business model, or between executive- or operational-level employees was identified. However, a small difference between participants from different functional areas was found in terms of the number of discussions or mentions of positive personal decision empowerment. Here, employees in a support function discussed their own personal empowerment less regularly than employees in the sales or services areas. While this is not likely to be significant in the overall results, the tabulated comparison is provided in Table 20 below.

Table 20: Summary of numbers of participants discussing or mentioning decision empowerment.

Type of Empowerment	Sales	Support Function	Services	Total
Mentions importance of positive decision empowerment	27	30	39	96
Identifies personal decision empowerment	17	9	19	45
Identifies restricted personal decision empowerment	3	3	1	7

An interesting finding concerned the participants indicating limited or restricted personal decision empowerment. Of the seven participants, three were senior executives. While it was possibly expected that operational-level employees may feel less personally empowered, it was surprising that three out of five senior executives also responded in this category. On further investigation, it was found that two out of the three senior executives actually mentioned in their interviews they supported decision empowerment *in their own staff*. In this regard, they closely aligned with the

broader executive cohort. Only one senior executive mentioned a view that neither himself, nor operational-level employees, were empowered to make decisions regarding the business model. This view is indicated by the following quote:

> I think – well, I don't think you and I are empowered to make decisions – I think we can contribute to it (Emmanuelle).

Ultimately, the finding that senior executives were less empowered to make decisions than operational employees aligns with Laudien & Daxböck's (2016) finding that in mature firms business model change emerges from the operational ranks of the firm; a core characteristic of complex adaptive business models discussed in 6.1.6. Here, for operational participants indicating they had personal decision empowerment - the level of this empowerment while described strongly but within set parameters. For example, a strong association with the previously discussed business model rules and boundaries was indicated. The following quotation summarises the interplay between the categories:

> I think everyone runs their own elements of the business model. The guidelines are there, in place (Oli).

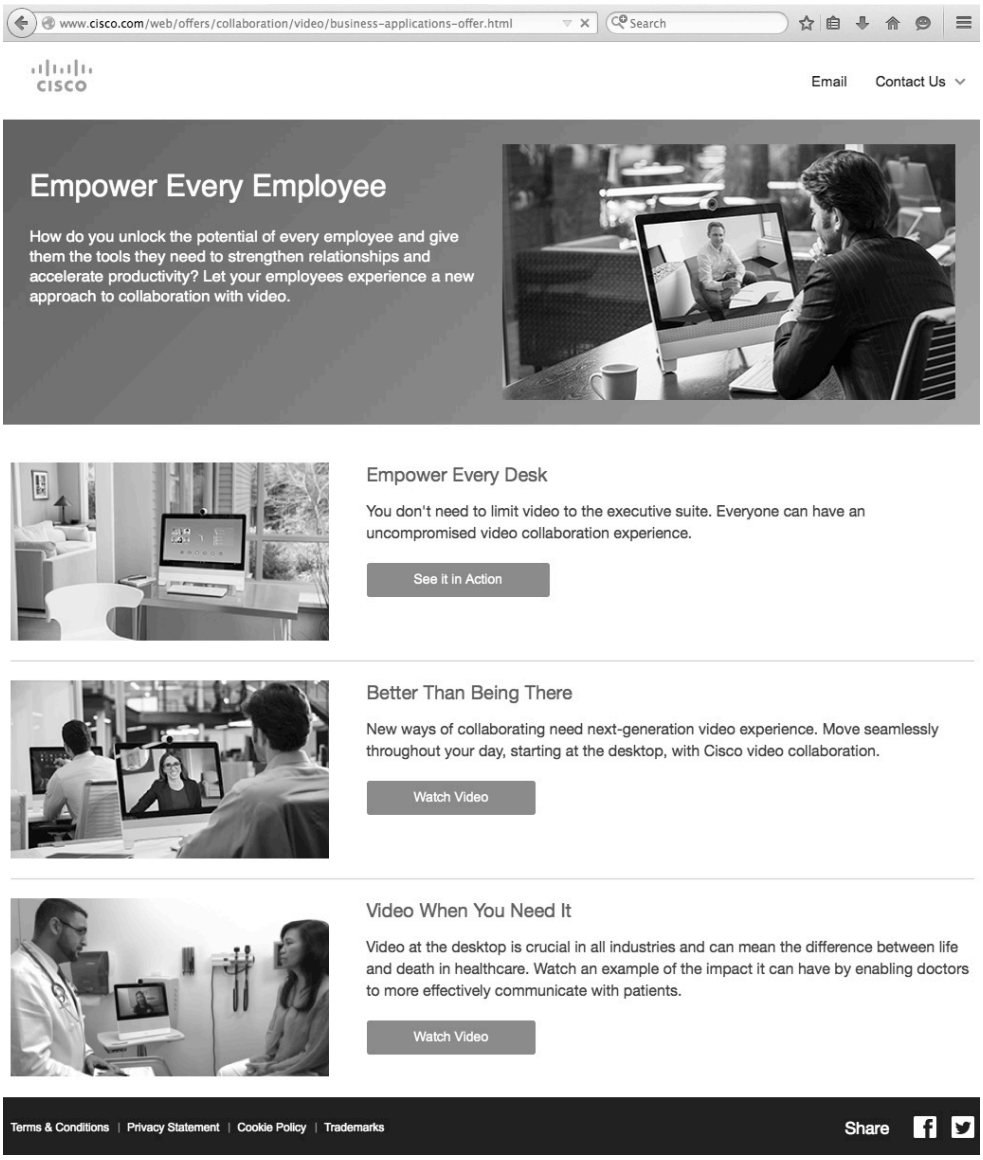
Indeed, although it was described differently by participants, the theme of being fully empowered but only within certain parameters recurred as indicated by the contrasting descriptions in the following quotations:

> I think one of the benefits of a sales company is you can make your own decisions. Each person runs their own business, but it's strongly numbers driven (Oliver).

> I think you get a menu of things to do and you decide where to focus. I think, as is the way of Cisco, we tend to be running multiple things all at the same time and it's up to you to work out what is the most – what's going to be most effective to your stakeholders and customers (Ocean).

Very high levels of employee empowerment align with Cisco's externally communicated value proposition and market messaging for another of its business models: Cisco 'collaboration'. The market in which this business model is located is worth $8.5 billion annually and Cisco holds a 16.5% market share ahead of its closest competitor and peer firm, Microsoft (Synergy Research Group, 2015). The key message in the value proposition Cisco communicates externally is the empowerment its collaboration solution(s) provides for its customers' employees. Cisco's lead marketing message aligns directly to 'empower every employee' as highlighted in Figure 23. It is therefore expected that Cisco follow its own mantra in terms of the empowerment it provides for its own employees.

Figure 29: Cisco's collaboration marketing message



Source: http://www.cisco.com/web/offers/collaboration/video/business-applications-offer.html [Accessed 18 November 2016].

Notwithstanding the high-level of decision empowerment, peer collaboration was also found to remain important in the overall decision-making process. Specifically, while 24 out of 27 participants mentioned the importance of decision empowerment in Cisco's business models generally, 15 also mentioned the imperative to collaborate when making a decision. Table 21, overleaf, contains a tabulation of participant

responses in these two categories, highlighting the overlap (in bold) and also showing that operational-level employees were more likely to mention the requirement to collaborate when making a decision than executives.

Table 21: Tabulation of participants mentioning decision empowerment and/or collaboration in the decision making process.

Participant identifier	Mentions importance of decision empowerment in Cisco's business model	Mentions importance of collaboration in the decision making process
Otto	**Yes**	**Yes**
Orson	**Yes**	**Yes**
Orpheus	**Yes**	**Yes**
Orlando	**Yes**	**Yes**
Orchid	**Yes**	**Yes**
Ophelia	**Yes**	**Yes**
Omari	**Yes**	**Yes**
Olympia	**Yes**	**Yes**
Olly	**Yes**	**Yes**
Olga	**Yes**	**Yes**
Olaf	**Yes**	**Yes**
Odysseus	**Yes**	**Yes**
Ocean	**Yes**	**Yes**
Edwina	**Yes**	**Yes**
Oswald	Yes	No
Osiris	Yes	No
Oran	Yes	No
Oliver	Yes	No
Omar	Yes	No
Odin	Yes	No
Eva	Yes	No
Elfie	Yes	No
Edward	Yes	No
Onofredo	No	No
Oli	No	Yes
Emmanuelle	No	No
Total	24	15

Intriguingly, the collaborative decision process described by participants also appeared to relieve the individual of significant personal accountability and insulated them from [some] negative consequences arising from bad decision outcomes. While this was only mentioned by five interview participants, the implication is that the decision maker drives the decision through a collaborative decision making process:

> When making a decision, make sure everyone supports it and you won't get shot if it goes badly (Ozzy).

However, in the alternative contradictory perspective it is possible that the necessity to collaborate in decision-making *restricted or delayed* the decision and thus *obscured* the linkage to an outcome such as a change in the business model. There is insufficient data to determine whether this perspective is the dominant of the two, but it is possible that decision collaboration *degrades* the notion of a complex adaptive business model and its ability to generate and solicit feedback, adapt, and ultimately emerge, as discussed below.

In summary, results indicate participants are empowered to make decisions within known parameters. Senior executives indicated less personal decision-making empowerment than junior staff. In making a decision to change an activity associated with the business model, the importance of collaboration was evident and removed a level of personal responsibility for the decision outcome. Finally, to further support these results I provide additional data generated by my in-depth interviews for 'agents' in Appendix 9.

5.4.4 Feedback

How does the business exhibit feedback?

Feedback both positive and negative was identifiable in both business models. Negative feedback was identified in terms of either formulation of plans or monitoring and control activities (Stacey, 1995) and was mentioned or discussed 59 times by 22 participants. Positive feedback identified in terms of either increasing growth (or success) or competitive lock-out (Arthur, 1996, 2013) was mentioned or discussed 39 times by 20 participants. In order to identify each feedback type, I used the specific identifiers listed below (and their appropriate synonyms), followed by an assessment of each interview statement containing the term in order to validate its inclusion in the respective category:

a. Negative feedback through monitoring & control activities (Stacey, 1995): assess, report, deviate, plan, control, metric, feedback (negative).
b. Positive feedback through increasing growth or competitive lockout (Arthur, 1996; 2013): lock, amplify, increase, compound, exponential, bind, extend, success, standards, advantage, competitor, feedback (positive)

Interestingly, I expected to encounter difficulties identifying feedback generally in the business models, and so, the number of mentions or discussions found was surprising. I furthermore expected that identifying *positive feedback* would be an even greater challenge because only a select number of firms have been identified as displaying increasing returns (Arthur, 1996). However, the following quotation represents a clear positive feedback mechanism that is precisely described by the interview participant:

> We were able to stamp the whole networking business with the term Cisco. So everything is 'Cisco-ised', if you like. Even right now, big companies who are big competitors of Cisco in the same area of the business, they're still considering us as the source of standards, even until now. We have been from the beginning with the training, the [CCIE], et cetera, all these training we run. We are still the leaders. We are still considered as the makers, the creators, the guards of networking, the guards of this area [20] (Olly).

Another easily identifiable example of positive feedback in the business model was indicated as follows:

> There's that classic, 'You never got fired for buying IBM' sort of thing. You never get fired for buying Cisco, and individuals want to get their hands on the Cisco stuff so they can increase their own expertise and get to their CCIE, which increases their own market attractiveness (Osiris).

Perhaps this should have been unsurprising, because as emphasised in Section 4.3.1, Cisco has previously enjoyed positive feedback in its core routing and switches business – the object of the Product business model (Gawer, & Cusumano, 2002; Earle & Keen, 2002; Wirtz et al., 2007; Highsmith, 2013). However, to further triangulate the results from my field interviews, I followed Arthur's (1996) approach of assessing a firm's external success in order to determine whether positive returns are evident. I thus assessed Cisco's success in the 'blade server' market (part of Cisco's Product business model) where Cisco is currently enjoying explosive growth.

[20] CCIE is a certification issued by Cisco and stands for 'Cisco Certified Internet Engineer'

Specifically, Cisco entered this market in 2009 with 0% market share and is currently is the worldwide market leader holding approximately 40% share, after recently overtaking its largest rival, Hewlett Packard. Figure 30 and Figure 31 illustrate this exponential growth, illustrative of a new positive feedback loop Cisco has established.

Figure 30: Cisco unified computing system growth rate 2009 to 2014

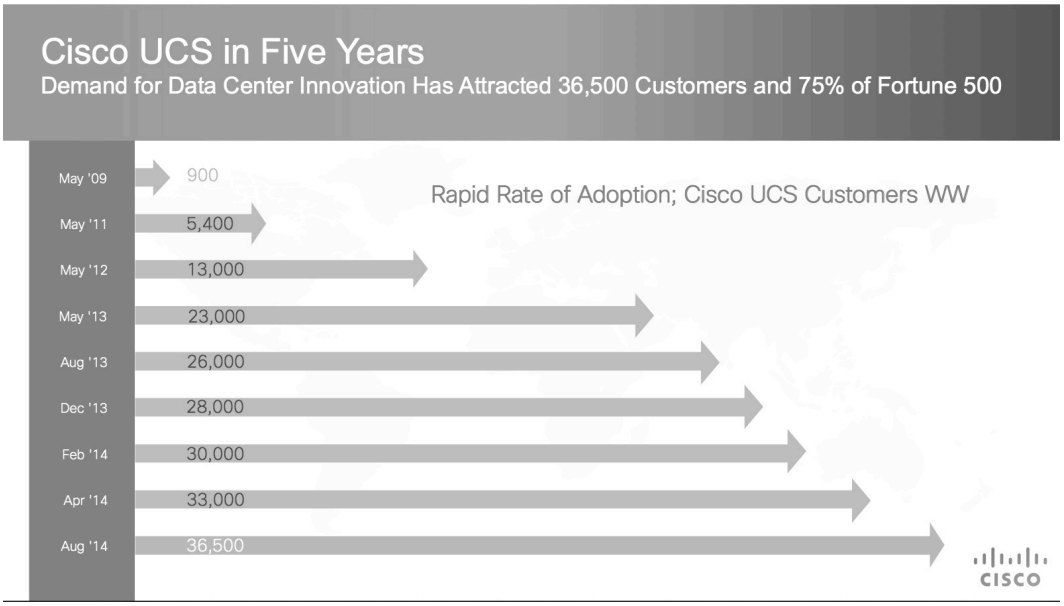
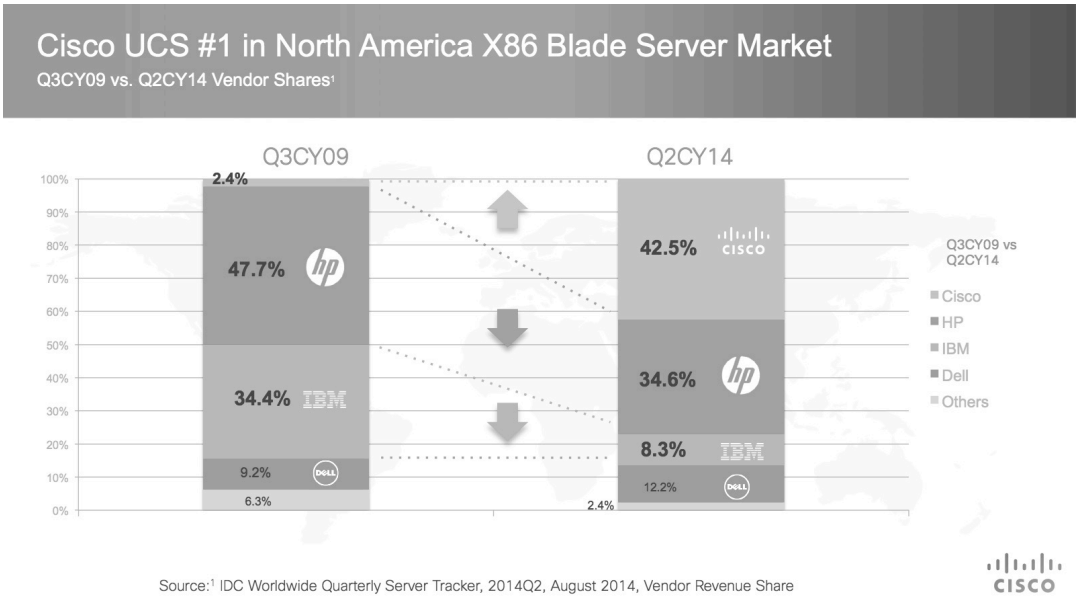


Figure 31: Cisco unified system growth market share comparison 2009 – 2014



Source for figure 24 & 25: http://www.cisco.com/c/dam/en/us/solutions/collateral/data-center-virtualization/unified-computing/cisco_ucs_market_share_infographic_final.pdf [Accessed 15 July 2016].

Negative feedback was found to be equally prevalent in the business model. In particular, there was a strong evidence of a negative feedback loop (a controlling mechanism) associated with customer feedback. The following quote is illustrative:

> I think it's important that we get the feedback such as how we can improve our current business model, because business evolves. We need to listen to the customer concerns or the customer feedback. That will definitely help improve the business, and also improve customer satisfaction. Yes (Orpheus).

Interestingly, the other main broad area of negative feedback identified (other than customer feedback) was financial. Examples of negative feedback were numerous in this category and included sales targets, incentives, financial performance metrics, growth, and profitability. Outside customer financial feedback, four alternative areas

were mentioned, indicating a looser planning and control function may exist in alternative functional areas.

No significant skew towards either business model (product or service), executive- or operational-level employees, or functional area was found in either category of negative or positive feedback.

In summary, results indicate that positive and negative feedback is evident in Cisco's business models. Positive feedback can be witnessed in high growth rates, competitive lock-out, market dominance, and setting the customer buying preferences for 'Cisco branded' solutions. Negative feedback can be witnessed in control activities conducted by the company such as listening to customers, monitoring activities, and ultimately assessing the business model's financial results. However, feedback being evident in both forms is insufficient for a complex adaptive business model to operate. Therefore in Section 6.1.4, I discuss why an optimal tension (i.e. fitness) between negative and positive feedback must be reached and indicate that the business model can even be guided by the interplay between the two. Finally, to further support these results, I provide select additional data generated by my in-depth interviews for 'feedback' in Appendix 10.

5.4.5 Adaptation

How does the business model achieve continuous change?

When asked whether the business model was changing and/or the frequency of change(s) to the business model, 22 interview participants out of 27 indicated the business model was in an ongoing process of change. Six participants indicated a more limited or restricted view. In the minority, expressing a belief that the business

model was not being changed, four participants acknowledged that change was occurring in the business model but believed the rate of change was 'slow'. Unexpectedly, two participants indicated the business model was static as illustrated by the below quotation:[21]

> But, at a super high level, our business model, I would suggest, hasn't changed in many, many years. I've been here 15 years. I fundamentally don't see I've seen too many whole-scale structural changes in that time. (Oli)

This notion that change was slow to occur in the business model was in stark contrast to the majority of participants who indicated that minor and/or small changes to the business model was 'constant'. Unfortunately, few participants defined what 'constant' or 'constantly' meant. Instead, most interview participants opted to describe the rate of change in broad generic terms and used descriptions such as 'always', 'constant', 'continual', 'regularly', 'tweaking' 'rapid' 'regular' etc. Only three participants defined a time period associated to change with the business model; one indicated change in the business model was daily, one semi-annually, and one monthly;

> Hardly a month goes by without something new occurring, whether it's an addition of capabilities, the company's purchased new capabilities – as in new organisations – or we're adjusting or tweaking the business model like I mentioned before (Olga).

[21] Two interview participants indicated both a broad view the business model was changing and also a view it was not changing. I have accepted this overlap in describing the numbers in each category.

Change as a constant feature in the external environment associated with the business model, and the commensurate requirement to adjust the business model in response to it was also universally acknowledged. All 27 participants were highly attuned to how external influences necessitated ongoing responsive change in the business model (although as mentioned above not all believed the business model was actually changing or was changing fast enough). The following quotation is illustrative:

> Having a dynamic business model is always important; something that flows and adapts based on go-to-market, based on technology trends, based on partner trends, based on competition, new competition, existing competition, financials, economics within the market – wow. The list is endless on that as well (Olaf).

The acceptance of the external imperative to adjust the business model extended to acceptance of the negative implications that flowed from that change. For example, four participants mentioned the regularity of wider restructuring in Cisco as a response to external change, with one participant highlighting how having an adaptable business model actually drove wider organisational implications:

> Adaptability [in the business model], nowadays, in my opinion, is key. It might not be very comfortable, because adaptability often means restructure, reorganisation, retrenchment and other Rs, but in terms of being nimble and adaptable, etcetera, it's essential (Otto).

The perspective that accepts adjusting the business model in response to external change, notwithstanding both positive and negative implications, appears deeply rooted in Cisco's wider culture. For example, Cisco has published a publicly available

white paper titled ‘digital business transformation: disrupt to win’, which outlines steps that firms should take to avoid being completely disrupted by external change. In the paper the authors highlight external change specifically targets operational business models:

> Digital disruption radically alters markets through the application of new digital technologies, and it challenges established business models (O’Connell et al., 2015: p.1).

Cisco’s prescription is to embrace technology to enable processes that are traditionally manual and/or cumbersome to become dynamic and easily changeable. Specifically, the authors assert that to remain successful in the future an organisation should digitise its entire infrastructure, processes, and systems. In turn, this will enable employees to make faster business decisions. The report highlights the example of banks continuing to use paper based mortgage application forms when online processing of the same application can lead to a faster decision outcome for the customer. In contrast by enabling decisions to made dynamically the authors believe that change to business processes can be implemented “in real time with tremendous efficiency” (O’Connell et al., 2015: p.11). In addition, these authors emphasise that:

> A digitally transformed organization is hyper-aware, predictive, and agile – with dynamic processes enabling it to adapt and thrive in an environment of near-constant change (O’Connell et al., 2015: p.2).

And they warn that:

> Adapting to rapidly evolving consumer behaviors and competition from disruptive innovators will be insurmountable for many; those who have already taken significant steps to digitize their business will be much better positioned to survive (O'Connell et al., 2015: p.6).

Cisco's current chairman, John Chambers, who led the company as CEO for over 20 years, has similarity warned that 40% of firms will not exist within 10 years. Chambers (2015b) indicates that to be successful firms must actively "disrupt or be disrupted" and believes change should be tried even if it fails. Chambers (2015b) also highlights being effective in this environment and actually implementing change is "all about speed".

Overall, it appears that it is a broadly accepted imperative within Cisco to constantly change the business model in order to respond to environmental change and this aligns with the *evolutionary perspective* on business models in which I have situated my notion for a complex adaptive business model. Consistent with this imperative, interview participants identified a number of examples of how this is achieved in practice. These examples have been categorised into internal and external driven changes and are listed in Table 22.

Table 22: Small changes to the business model categorised internally and externally

Internal	External
Adjustments to governance structures	Responding to competitor threats
Improvement projects	Fulfilling non-standard customer requests
Hiring new skills	Running new sales campaigns
Restructures	Launching new products or solutions
Developing new innovations	Adjusting partner programs
Building internal capabilities	
Acquiring intellectual property (acquisitions)	
Operational model improvements	

The examples provided in Table 22 are not exhaustive, they are simply a list of examples of changes mentioned by interview participants. While these changes can be considered small changes that easily fit inside and do not threaten the overall business model structure, five participants highlighted the existence of a causal link between minor changes and a resulting major change to Cisco's business model(s) as outlined in Figure 20 and Figure 22. The following quotation is an excellent description of this relationship:

> I think there would be micro-changes that lead to that groundswell, at which point, in a year or two, you look up and you say, 'The business model no longer matches what we do' and therefore that forces a change to the business model (Edwina).

No difference between the Cisco Product or Services business models, executive- or operational-level employees, or in functional area was found in the results for adaptation.

In summary, the imperative to constantly change the business model was strongly associated with changes seen in the external environment and this imperative is likely embedded deeply in Cisco's culture. I discuss how impactful it is to change the assumptions relating to environmental change and contrast the differences between the *mainstream* and *evolutionary* perspectives in Section 6.2. In essence this change results in a fundamentally different perspective on how the business model operates.

In summary, results further highlight that Cisco achieves change to the business model by having established change programs, digitally enabling its processes and infrastructure, and implementing change as fast as possible irrespective of the potential negative implications. Finally, to further support these results, I provide select additional data generated by my in-depth interviews for 'adaption' in Appendix 11.

5.4.6 Emergence

Has the business model changed in unplanned or unexpected ways?

Emergence is identifiable though large changes to the business model which are also unplanned and/or unexpected. These types of changes are related to the more minor and/or constant changes discussed in the adaptation section above, but more significantly alter the business model in *unforeseen* and/or *unexpected ways.* In Section 6.1.6, I confirm that a complex adaptive business model will seek its own direction in response to environmental feedback and change itself, without the ability of management to plan in advance for or fully control its development. In this regard, 20 out of 27 participants indicated that at least one major change to the business model had not been planned. Conversely nine participants mentioned a major change they believed was fully planned before its implementation.

The relatively small number of participants indicating that a major change was planned was surprising. On investigation, the definition of 'planning' was found to be an issue. Of the 20 participants who indicated that planning was *not* conducted before a change was made, 8 indicated that a more emergent type of planning was practiced. The emergent planning was described as plans being formulated as change itself occurred. The following quotation is instructive:

> I use the railroad, the Nick Earl analogy, the Wallace and Gromit one where yes, they're planning it but they're planning it like the guy who's sitting on the railroad cart laying track in front of him at the time (Olga).[22]

The theme of having a plan to respond to change to stimuli (internal or external) rather than a fully executable plan for major changes to the business model, was constant across the majority of participants. For example, focusing on the broader motivation to change that emanates from the external environment, five participants mentioned Cisco has a plan to respond quickly and decisively to external change events:

> Planned? Again, first thing into my mind is I think most of them have been responses to external stimuli… I think we identify that there's an issue through a market transition or something and then we respond to that (Odin).

To reconcile the issue of the type of planning conducted in the business model, I limited the 'planned category' to only include traditional long-range planning and or changes planned at a corporate level and announced publicly and retained the

[22] Nick Earl is a Cisco Vice President.

emergent planning activities mentioned by interview participants in the ‘not planned category’. Consistent with this approach, a matrix comparison outlined in Table 23 provides a level of alignment between responses. Specifically, 10 participants indicate that major change is both surprising and is not planned. These participants are identified in bold. Furthermore, four out of five executive-level employees also indicate that change to the business model is not planned in the traditional sense.

Table 23: Comparison between planned change to business model and surprise.

Participant identifier	Expresses surprise at a major change in the business model	Indicates a major change was not planned
Edwina	**Yes**	**Yes**
Ophelia	**Yes**	**Yes**
Ocean	**Yes**	**Yes**
Olga	**Yes**	**Yes**
Omari	**Yes**	**Yes**
Oswald	**Yes**	**Yes**
Olaf	**Yes**	**Yes**
Odysseus	**Yes**	**Yes**
Osiris	**Yes**	**Yes**
Orson	**Yes**	**Yes**
Olly	Yes	No
Orpheus	Yes	No
Edward	No	Yes
Emmanuelle	No	Yes
Elfie	No	No
Eva	No	Yes
Oliver	No	No
Odin	No	Yes
Oli	No	Yes
Omar	No	Yes
Oran	No	No
Olympia	No	Yes
Orchid	No	Yes
Orlando	No	Yes
Ozzy	No	No
Otto	No	No
Onofredo	No	Yes
Total	12	20

No significant difference between the Product or Services business models, level in the organisation, or in functional area was found in the results for emergence.

In summary, results indicate that the business model changes in unplanned and/or unexpected ways. Cisco has a capability to respond quickly and decisively to change

events, rather than always conducting traditional long range planning activities. Traditional corporate planning is employed by Cisco but in a reactionary mode and follows change to the business model by formalising it. Finally, to further support these results, I provide select additional data generated by my in-depth interviews for 'emergence' in Appendix 12.

5.5 Primary research question

I provide a collation and summary of the results generated by my supporting research questions in Table 24, overleaf:

Table 24: Summary of supporting research questions and key results

Expected characteristic	Summary of result
RULES What rules and guidelines are identifiable in the business model?	Five high-level rules are identifiable in Cisco's business models. They are: • Make good choices. • Follow the law. • Act ethically. • Always do the right thing by the customer. • Make it profitable.
BOUNDARIES What boundaries are identifiable in the business model?	Three categories of boundaries are identifiable in Cisco's business models. They are: • Financial & legal. • Organisational. • Customer & external.
AGENTS How does the business model empower its participants to make decisions?	• Employees are empowered to make decisions in Cisco's business models, as follows: • Within set parameters. • By collaborating with peers. • By being relieved of a level of personal responsibility for the decision outcome.
FEEDBACK How does the business model exhibit feedback?	Both positive and negative feedback is exhibited in Cisco's business models, as follows: • Positive feedback: high growth rates, competitive lock-out, market dominance, setting the customer buying preferences for 'Cisco branded' solutions. • Negative feedback: control activities such as listening to customers, monitoring activities, and assessing the business model's financial results.
ADAPTATION How does the business model achieve continuous change?	Cisco's business models achieve continuous change by: • A culture that expects change to occur. • The operation of change programs. • The implementation of multiple small changes. • Digitally enabling processes & supporting infrastructure. • Implementing change as fast as possible.
EMERGENCE How does the business model change in unplanned or unexpected ways?	Cisco has a capability to rapidly respond to change events by employing an emergent form of planning, which is conducted while the event is occurring.

It is clear from the summary provided in Table 24 and the results more broadly described in this chapter, that **Cisco's business models contain and exhibit the six characteristics of a 'complex adaptive business model'** as outlined in Section 3.2. Taking into account the potential for my results to be transferrable (Eisenhardt, 1989; Aken, 2004) to Cisco's peers (discussed further in Section 7.1.3 of Chapter 7), I address my primary research question by demonstrating empirically that **one mode in which high-technology business models might evolve in practice is by functioning analogously to a complex adaptive system**. I have followed the view of Stacey (2007), who indicates that social systems *cannot* be identical to systems that operate in the natural sciences context. Therefore, *I do not assert that business models are exactly the same* as complex adaptive systems.

5.6 Summary

This chapter contains complete and comprehensive representations of the Cisco Product and Services business models. The definitions of Cisco's business models are valuable because no holistic and/or recent definitions pre-existed this research. I then presented results against the six defined supporting research questions, each of which is mapped to a characteristic expected in a complex adaptive business model. Results for each question have been individually expressed and combine primary and secondary data sources as appropriate. The results from my supporting research questions demonstrate that **Cisco's business models function analogously to complex adaptive systems, thereby providing *one explanation for how they evolve in practice***.

6 DISCUSSION

The high-technology sector is acknowledged as a complex fast-moving environment that supports exponential growth of some firms and witnesses ongoing disruptive innovation (McGrath, 2010; Arthur, 1996; Christensen, 1997). Cisco has navigated this environment for over a quarter of a century. Intriguingly, while Cisco has launched many new business models over the last decade, it has refrained from making major *planned* change to either its Product or Services business models or otherwise engaging in executive-led business model innovation (Chesbrough, 2010). Instead, as outlined in Section 5.4.5, Cisco expects business model change to be constant and its two major business models exhibit the capability to adapt to changes in the environment over time.

To account for this phenomenon and explain how some business models have the capability to evolve spontaneously, I have demonstrated it is theoretically feasible to conceive business models in the high-technology sector as functioning analogously to complex adaptive systems. In turn, this provides one possible explanation for how business models evolve in practice. Further, conceptualising business models as complex adaptive systems also has significant theoretical and practical managerial implications. The notion involves paradigmatic conflict. Business models cannot remain both conceptualised in both a neoclassical paradigm and in complexity science because underlying assumptions clash. This conflict has particular implications for the *mainstream perspective* on business models because the effectiveness of mainstream strategy and the role of management of the business model may need to be reconsidered. For instance, if it is accepted that the economic system in which business models operate is open and characterised by the

possibility of multiple equilibria, then the concept of a firm being able achieve a sustainable competitive advantage through its business model is challenged. Likewise, the efficacy of the associated managerial practices, such as long-range planning relating to the business model may also need to be revised. There are also significant implications for the *evolutionary perspective* on business models. For example, the unique features of complex adaptive systems, and complexity in general, should be considered in the strategic settings for the business model and the firm itself.

This chapter examines these implications. I commence by discussing results and implications applicable to each characteristic of a complex adaptive business model. Then I contrast assumptions that underlie complex adaptive business models with those that underlie the *mainstream perspective* on business models. I follow this up by outlining the benefits of complex adaptive business models in their totality. I then discuss how organisations might be designed and structured to facilitate complexity principles and the operation of a complex adaptive business model. Finally I assess how the notion of a complex adaptive business model compliments and challenges literature on business models.

6.1 Characteristics of a complex adaptive business model

6.1.1 Rules

Rules are a defining characteristic of complex adaptive systems and of social systems more broadly. In society, rules are evident at a macro level in the form of laws set by government and at an individual level in the forms of accepted social conventions and personal behaviour. Firms mimic this hierarchy and have their own formal high-level rules (e.g. their constitutions) and informal rules (e.g. their culture).

It is therefore unsurprising that as outlined in Section 5.4.1, participants involved with Cisco's business models identified the presence of rules in the business model; significantly, five rules were identified. Five is an appropriate number because it is known that in a complex adaptive system, novelty will occur in a context of limited numbers of defining rules.[23]

Cisco's business rules are not fixed. They are reviewed periodically and updated yearly primarily through the issuance of new Cisco employee identification badges. At an individual level, this indicates Cisco's rules are adapting and evolving. Beinhocker (1997) suggests that if rules are fixed then the system is dynamic, but if the rules are evolving, the system is complex adaptive. This assertion is also supported by Stacey (1995). To be consistent with this observation, the rules applicable to a complex adaptive business model must be in a constant evolutionary mode; externally, applicable rules constantly change and the business model itself generates its own subroutines (Holland, 2006). This leads to a paradox. While management can foster a complex adaptive business model by initially setting rules applicable to the preferred model, management is in the weakest position to operationally control a complex adaptive business model through its rules. This is because the most rigid rules are externally imposed, usually laws or regulations or other immutable restrictions (Fuller & Moran, 2001), while the most dynamically impactful rules are created by agents inside the complex adaptive business model itself (typically employees, departments, customers, etc.). Consequently, at a certain point in the evolution of a complex adaptive business model, the rules set by management may be overridden by self-generated rules (an experience typical to management in many

[23] Holland (2006) uses the game of chess to illustrate the point that with fewer than a dozen rules the game has generated novelty over an extended time. Importantly, there is no 'optimal' number of rules. For example, Google has ten business rules (Google, 2013). For such a large organisation this is a still a small list of high-level rules that provide maximum scope for the firm's innovation potential.

firms). Breaking rules in Cisco's business models was a strong finding in the results seen by participants as a natural part of their interaction with the business model.

Nevertheless, the initial setting and potentially re-setting of rules in a complex adaptive business model is a critical activity for management that should be considered carefully. This is because rules set by the firm govern the environmental setting(s) for the business model that, in turn, drive the behaviour and flexibility of the business model both internally and in aggregate. Set too tightly, the business model will never have the scope to become complex adaptive. Set too loosely, and the firm will relinquish influence over the very purpose of the business model. To avoid direct conflict between business model participants and 'management', rules should be structured to consider the firm's purpose, its culture and corporate ambitions, and the necessary empowerment of its business model stakeholders; I expand on these points in Section 6.4.1. An example of a Cisco business model reflecting Cisco's corporate ambition is the rule: 'make it profitable'.

Therefore, management should set rules that are both simple and specific. The approach of using simple rules to manage a complex adaptive system in an organisational setting is supported by Wheatley (1994), Pascale et al. (2000), and Beinhocker (2007). Interestingly, Eisenhardt & Sull (2001, 2012) extend the concept of rules into strategy more broadly and advocate that strategy itself should considered simply as 'simple rules'. Importantly this premise is heavily based on experience with Cisco as the following quotation illustrates:

> Companies like Intel and Cisco relied not on complicated frameworks but on simple rules of thumb. This was true even though they were in extraordinarily complex, challenging, and fast-moving industries. The

rules were not only simple, we found, but quite specific (Eisenhardt & Sull, 2012: p.1).

6.1.2 Boundaries

An open system must respond to its environment by importing and exporting energy across its boundaries (Miller & Rice, 2007). In the context of Cisco's business models, two types of boundaries were identified. The first, while not described explicitly as a 'boundary' in Chapter 5, is the overall boundary around the entirety of the business model. This is the type of boundary implied by Figure 20 and Figure 22. While each representation outlines Cisco's Product and Services business model system(s) Section 5.3 highlights that to operate, each business model relies a much wider ecosystem of participants. In this context, imported and exported energy was overwhelmingly identified as information and typically described as 'meeting customer requirements' or 'meeting customer feedback'. Clearly this is not the only commodity received or generated by a business model. For example, the Cisco Product business model manufactures many millions of physical items each year and delivers them to customers as its products. To achieve this, a continual importation and exportation regime of many thousands of different items must be in place across the entirety of Cisco's supply chain. It was thus somewhat contradictory that participants did not mention more elements that traversed business model boundaries between the firm and external stakeholders because of the sheer volume of items that must bilaterally move across the business model boundary for outputs to be generated. Therefore, taking into account the level of integration with external participants and the volume of items traversing the 'boundaries' of each business model, it is thus appropriate to consider each one an open system without an identifiable 'hard' boundary (Mitleton-Kelly, 2003) at all. Instead, it is appropriate to

conceive complex adaptive business models as having an extremely wide 'boundary zone' which is in constant state of flux. This observation echos Ilinitch et al. (2006) who believe the very notion of organisation has evolved, from a bureaucracy with clear boundaries and internal areas of authority, to a new form that has fluid and flexible external and internal boundaries.

It is managerially significant to view a complex adaptive business model as having wide and highly porous boundaries across which the exchange of both internal and external change occurs. It implies that the closer employees are situated to external stakeholders, the more efficient exchanges will become – whether exchanges are information-orientated or financial in nature. It also implies that managers involved with recurring process-orientated tasks should constantly test whether such tasks have ongoing utility for the business model. Ultimately, this implies a complex adaptive business model requires a flat organisational structure and it is worth noting that many traditional firms have many layers of management; these isolate many decision-makers from much information pertinent to their decisions. It is also worth emphasising that it is characteristic of many firms that they continue with many routines and processes that are deeply culturally embedded even though their utility has long since diminished. In a complex adaptive business model all participants must continually ask what they should both start doing and stop doing.

Finally, it should also be observed that the propensity for change, mentioned by participants involved with Cisco's business models indicates that a complex adaptive business model is not an '*autopoietic'* system: a self-sufficient system that is essentially insulated from the external environment and only engages in its own pre-programmed routines irrespective of what is occurring outside its borders. Traditional

business models that continue to generate the same outputs irrespective of customer feedback or changed market dynamics more closely represent an autopoietic system.

The second type of boundary discussed in Chapter 5 (Section 5.4.2), was specific restrictions or limitations to the business model. These were identified both internally and externally to the firm. Similar to rules, the most 'immovable' boundaries in this context are externally applied and exist in both governmental (for example, regulations and laws) and market forms (for example, market expectations). However, it is important to note that whist perceived as immovable, and while in place are indeed fixed, external boundaries can change mimicking the changing of rules mentioned above. Governments change, new laws and regulations are introduced, and regulators themselves focus on different areas of potential non-compliance. In addition, the firm itself can change its own boundary conditions, although in some firms the speed of change can be quite slow.

The changing nature of boundaries in a complex adaptive business model also mimics the propensity for participants to test boundaries. The interplay between the two – the testing and the changing of boundaries – is important for managers of the business model to understand. For example, a stakeholder at any organisational level can sponsor a case for change internal to the firm and, equally, there are many examples of firms themselves acting to change government policy. Thus, a core competence of participants involved with a complex adaptive business model is being able to actively change boundary conditions (and other similar areas such as rules) through both formal and informal means at both micro and macro levels. Related to this, firms must enable and support a culture where change initiatives are

encouraged and supported, irrespective of their ultimate success. This culture shift is significant as many firms view this activity as unsupportive of its direction and senior managers are protective of their own perceived control.

6.1.3 Agents

A complex adaptive business model must contain *empowered* decision-making participants at all hierarchical levels as a precursor for any adaptation and/or emergence to occur. Decision empowerment was thus expected and Section 5.4.3 finds strong evidence that of this in Cisco's business models. The imperative to collaborate in the decision-making process was unexpected. On reflection, collaboration, discussion, and communication more broadly is an information exchange (feedback) mechanism. In this context, the presence of collaboration in the business models provides further evidence that agents are acting consistently with the principles of complex adaptive systems. This is because, due to the complexity of the operational environment associated with the business model and the impossibility for each participant of the business model to 'know everything', collaboration is a natural way to expand a local knowledge base. Moreover, while participants are able to make their own autonomous decisions, a high-level of inter-dependence exists between participants because they are ultimately forced to perceive the system and therefore rely on colleagues to provide feedback on the potential effects of a decision in their control areas. This is, of course, done in varying degrees consistent with each participant's own personal characteristics (Fuller & Moran, 2001).

At a higher-level, a population of participants (as opposed to an individual or small group of participants) empowered and collaborating in the decision-making process associated with a complex adaptive business model (and more generally in the firm)

has important benefits. In particular, Axelrod & Cohen (2000) identify three managerial benefits: (i) the possibility for learning new strategies is increased; (ii) the population can receive new-found improvement; and (iii) the population serves as part of the environment in which it lives. This, in turn, provides an individual manager (i.e. a business model participant) a greater opportunity to learn from the population who face similar problems to their own, and the opportunity to spread their learning.

6.1.4 Feedback

The mechanism of feedback, in both its negative and positive forms, provides the basis on which adaptation and/or emergence in a complex adaptive system can occur. Strongly resident and identifiable in Cisco's business models, a natural tension exists between the two. For example, while positive feedback is analogous to the economic concept of increasing returns (Arthur, 1996) and therefore attractive for managers, negative feedback provides a necessary but not directly associative counterbalance. Ultimately, the aim of management should be to find an optimal tension (i.e. 'fitness') between the two because this provides a *potential way* to *guide* the business model. The term 'guide' is used in this context because it is not likely a complex adaptive business model can be completely 'directed' or 'controlled', while also retaining its emergent properties.

Counter-intuitively, encouraging growth by establishing a positive feedback mechanism is difficult for managers to achieve. This is because negative feedback in the form of reporting, data collection, status updates, balanced scorecards, etc. is familiar and therefore typically overweight in many businesses. Positive feedback is initially difficult to identify and is often left unsupported by management until a threshold is passed, where it becomes impossible to ignore. In this way, it is possible

or even likely that many firms that enjoy the benefits of positive feedback and increasing returns achieve this through luck or circumstance rather than good management. Nevertheless, positive feedback can be encouraged. One way is supporting initiatives in the business model equally, rather than dismissing ideas because they do not align with corporate strategy. Another way is not treating outlier-reported events on standardised reports as necessarily negative; instead, seeking to understand the deeper reason for their existence. A further way of encouraging positive feedback is to have a strong internal and external listening program in place. A practical example of this is establishing a staff 'prediction market', which works to gauge the probability of outcomes by using the wisdom inherent in the firm's employees on the expectation this will be more accurate than the 'guesses of executives' (Broughton, 2013). Consistent with the directional benefit of harvesting employee knowledge, it was clear from the Cisco interviews that each staff member was expert in their field and had deep insight into the business and market in general – capturing this insight and seeking to engage with the potentially unexpected should be a top management priority.

6.1.5 Adaptation

As mentioned in the discussion of rules above, rules set by management can potentially be overridden by self-generated rules of the business model. At a high-level, the reason why codified managerial business rules may be overridden is the empowerment given to agents (employees) inside the complex adaptive system. In this context, each agent is logically seeking to adapt to circumstance and that creates unavoidable tension when rules restrict this evolution. Notably each factor that enables adaptation such as intelligence, empowerment, and goal seeking was strongly present in Cisco's business models.

At a more detailed level, Fuller & Moran (2001) indicate that adaption requires learning that manifests in behavioural change and passed on in various formats including culture, social processes, knowledge, etc. In a similar vein, Rottner (1999) indicates co-created protocols are a form of system rule and Lichtenstein (2000a; 2000b) highlights that an industry- or sector-level competitive dynamic has a similar moderating affect to a rule. Possibly more significantly, Holland (1995) points out that adaptation requires agents to change their own rules as they accumulate experience. This is particularly important when agents' own local goals are considered; agents will take advantage of the overall system's rules to achieve their preferred outcome(s) (Bebbington, 2013). McCarthy et al. (2006) supports this proposition indicating that agents will change their behaviour consistent with internal rules which will include – in the case of individuals – personal gain considerations (Rogers, 2003).

Therefore, where rules do conflict, an agent will make a decision based on accumulated experience and their expectation of the future. In other words, if management attempt to change a business rule in conflict with the rules operating inside the complex adaptive business model, change may only be partially adopted or ignored. The ability to 'self assess' or 'self determine' new rules consequently gives complex adaptive business models the ability to *directly* constrain and/or contradict managerial or strategic intent and this ability challenges *mainstream* business model theory. This aligns with Lichtenstein's (2000a; 2000b) view that rule-creating and rule-following *is itself* an emergent, self-organised process inside a complex adaptive system and McCarthy et al.'s (2006) observation that rule-breaking is part of the system self-organising. In Section 2.3.6 I have outlined these properties in further detail and indicate that such change in a complex adaptive system means it follows an unpredictable equilibrium path. The clear managerial implication is to

accept that adaptation is an ongoing process and the business model will never be in a ‘steady state’. More particularly management should encourage personal empowerment and accept that increased empowerment means less managerial control.

6.1.6 Emergence

A complex adaptive business model can exhibit various forms of emergence over multiple dimensions. Conceived in traditional business models as flexibility and/or business model innovation, the primary difference is the concept of ‘control’. In a complex adaptive business model, control is non-hierarchical in the traditional sense and managing the business model is by way of setting optimal business rules, as discussed above. A complex adaptive business model is guided by these rules and the underlying core logic of the firm, usually manifest in the firm’s culture, but that does not rely on the firm’s formal management structure for specific direction. Disconcertingly for management, a complex adaptive business model will develop its own hierarchy (for example, a ‘super-user’ in the case of Wikipedia) and seek its own direction as outlined in the section above.

‘Direction’ in this context means, that over time, a complex adaptive business model will co-evolve with its stakeholders and in particular with the firm. The emergent properties of the business model therefore provide scope for the firm to ensure its own organisational survival, by achieving a continuous dynamic fit (refer Section 2.1.5) with the external environment. Cisco’s Intercloud (Cisco, 2015) initiative is an indicative example. The initiative reduces Cisco to one of multiple participants in the technical Intercloud architecture and thus diminishes Cisco’s ability to ‘control’ the outcome. At the same time, the Intercloud represents a way for Cisco to compete

with dedicated cloud infrastructure providers, such as Amazon, thus providing a possible way of ensuring organisational survival against this new but significant threat to Cisco's Product and Services business models. My results also support this perspective. For example, in Section 5.4.6 I have identified that the majority of major changes to the business model were not pre-planned nor generated top-down. Instead they were initially generated at the operational layers of the firm and then supported in their development by an emergent form of planning – that formalised the change itself.

Consistent with the direction of previous investigations of managerial implications in a disruption-led environment (Christensen, 1997; Beinhocker, 1997; Johnson et al., 2008; Christensen, 2011; Kagermann et al., 2011; Eisenhardt & Sull, 2001; 2012; McGrath, 2013), successful future management will require abandonment of many historical perceptions and heuristics. It will require the embracing of a new perspective, particularly regarding concepts of organisational direction and measures of firm success. From the perspective of managing in a highly-emergent environment and in order to reconcile an existential crisis for managers, Nonaka et al. (2001) believe that the organisation should be seen as a venue or a field (Bourdieu, 1977) that facilitates interactions between the firm and its stakeholders, both internal and external.

6.2 Underlying business model assumptions

As mentioned in my Introduction, the reason I have extended the evolutionary perspective on business models and grounded the concept of a complex adaptive business model in complexity science, is that I have followed Alvesson & Sandberg's (2011) guidance for developing impactful research questions and problematized the

mainstream perspective on business models. In Section 2 of Chapter 2, I identified the following underlying assumptions attached to *mainstream* business model theory.

First, when a practitioner employs the concept or says the phrase 'business model', they do not fully understand what it means or includes. In Alvesson & Sandberg's (2011) typology of assumptions open to problematization, this assumption can be considered a 'field assumption' because the term has been popularised in many areas in society; for example, from management to politics.[24] Second, the perspective in management and organisation studies that business models are synonymous with mainstream strategy has been emphasised. This can be considered a 'root metaphor' assumption inside the discipline that sees business models simply as an image of strategy. Third, paradigmatic assumptions of neoclassical economics – as they shape business models through the relationship with mainstream strategy – have been exposed and critiqued in detail. This can be considered a 'paradigmatic assumption' because it relates to an existing belief system (neoclassical economics).

In Table 25, I provide the typology of assumptions which attach to the mainstream perspective on business models, contrasted with my grounding for a complex adaptive business model as conveyed in Chapter 3. Table 25 clearly highlights how the underlying assumptions that attach to business models are impacted by the concept of a complex adaptive business model.

[24] For example, the term was popularised by Australian politicians who constantly used the phrase 'break the people smuggler's business model' in the 2014 Australian federal election campaign. For further information see: http://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1213/13rp02#_ftn1

Table 25: Assumptions attached to the mainstream perspective on business models versus complex adaptive business models

	Type of assumption	**Mainstream perspective on business models**		**Complex adaptive business models**
	(Problematization methodology)	**(Neoclassical assumptions)**		**(New assumption)**
Inclusions	Field	Neoclassical foundations	→	Complexity science foundations
Association	Root Metaphor	Mainstream strategy	→	Emergent strategy
Association	Paradigmatic	Neoclassical economics	→	Evolutionary Economics
System	Paradigmatic	Closed	→	Open
Environment	Paradigmatic	Equilibrium	→	Disequilibrium
Purpose	Paradigmatic	Sustainable competitive advantage	→	Perpetual novelty: survival over time

My typology of assumptions is supported by Massa et al. (2017). While independently developed and therefore different in origination, focus, and inclusions, the authors confirm that the business model concept contains underlying assumptions that challenge traditional theories of value creation and capture. Consistent with my description of the *mainstream perspective,* the authors define such traditional theories as the “resource based view” and the "positioning view” (p.75). For comparison I provide the assumptions Massa et al. (2017) identify in Table 26.

Table 26: Traditional theories versus business models

Assumption	Traditional Theories	Business Models
Behavioural Assumptions		
Perfect Information	Assumed	Not necessarily assumed
Unlimited cognitive abilities	Assumed	Not necessarily assumed
No externalities	Assumed	Not necessarily assumed
Single source of competitive advantage	Assumed	Not necessarily assumed
Value creation and capture assumptions		
Value creation	Supply side only	Can be demand side and/or supply side
Value capture	Supply side	Can be demand side and/or supply side (Monetisation)
Sources of competitive advantage	Resource based or activates based on the supply side only	Can be resource based and/or activities based on the demand and/or supply side

Source: Massa et al. (2017: p.93).

From the above, it is evident that changing underlying assumptions that attach to business models leads to significant implications for scholars and practitioners alike. For example, when viewing a business model, or indeed a firm, through a closed-system lens, such as that adopted in the *mainstream perspective*, change can be perceived as linear and predictable. In this context, strategic planning is viable and can lead to expected outcomes such as capturing value through the business model and thereby gaining a sustainable competitive advantage for the firm. But when business models are conceived in the *evolutionary perspective*, an open-system perspective is embraced and change is perceived as frequent, oscillating, and unpredictable. In this context, long term strategic planning loses its utility and can

even be value-destructive particularly if followed rigidly. Further, if it is assumed that there is an overriding trend towards equilibrium then mainstream strategy seeks to maximise profitability. However, if multiple equilibria are expected in the economic system, then continued investment in new products, services, processes, and capabilities become critical and returns cannot be guaranteed let alone 'maximised'. Finally, the purpose of mainstream business model theory is to enable the firm to reach a point of sustainable competitive advantage or some other type of ascendancy over its environment, by capturing value through the business model. Unsurprisingly the typical management focus is on revenue maximisation, competition, market share, and 'winning'. This is in stark contrast to a complex adaptive business model where its purpose is the creation of value generally for stakeholders of the business model, to provide maximum scope for survival over time. Interestingly, 'value' is also potentially quite different and may be delivered to stakeholders in non-monetary measures. Metrics like satisfaction, efficiency, outcomes, etc. may become equally important to financial measures. In summary, a complex adaptive business model operates for a different purpose, delivers differentiated outcomes that may be monetary or non-monetary, and is optimised to respond to change that is expected externally.

6.3 Business model characteristics are enhanced

Interestingly, while complex adaptive business models can potentially address known problems with neoclassical assumptions, *key benefits* inherent in traditionally conceived business models remain present in complex adaptive business models. For example, a complex adaptive business model can operate to extend the benefits of business model innovation (Chesbrough & Rosenbloom, 2002; Chesbrough, 2007; 2010; 2013) through the complexity mechanisms of interaction, feedback, adaptation,

and emergence. Moreover, consistent with good business models improving the firm, the complex adaptive business model is also inherently more flexible, its stakeholders are more engaged and empowered, and formal management overhead is reduced. In this vein, complex adaptive business models can help reconcile issues with organisational fit and suitability, by evolving into organisational sub-spaces. This is paradoxical because the evolution will benefit stakeholders of the business model generally, but potentially not the firm itself, if measured by traditional means *viz.* by financial metrics.

Other characteristics of good business models are also identifiable in complex adaptive business models. For example, a complex adaptive business model is flexible, modular, and expandable. It will reinforce native inputs available to it and dampen weaknesses in the business model, firm, or resource bundles it accesses. This parallels the concept of good business models being reinforcing (Casadesus-Masanell & Ricart, 2011). Finally, a complex adaptive business model also inherits key benefits of traditional business models, in terms of conceptualisation, communication and abstraction.

6.3.1 Firms' resource limitations and boundary restrictions are overcome

An important premise of the complex adaptive business model concept is the engagement of all stakeholders involved. In practice, this involves inviting employees, stakeholders, customers, suppliers, commentators, etc. to take part in the business model itself. The implication of this is that it recasts the firm from the 'owner' of a business model, to a 'facilitator' and possibly 'participant' of 'its' business model. In one way, this dilutes the firm's control over the business model's outcomes, but in another enables previously unachievable outcomes to become possible. Here,

Kagermann et al. (2011: p.163) have already identified that “manufacturers like IKEA, Cisco, and Hyundai act as orchestrators” in order to form ecosystems.

The changing role of the firm and its control over the business model can be highlighted when previously restricted entities engage. Restricted entities in this context are often competitors, ex-employees, or dissatisfied customers. Instead of blocking these parties from engaging, a complex adaptive business model accepts their inputs as valid: complaint, criticism, commentary, and suggestion are all forms of feedback that this business model will respond to. This parallels developments in industry more broadly. For example, user-generated review businesses such as TripAdvisor, encourage totally transparent information exchange which cannot be controlled by any one firm. Consistent with the popularity of comparison businesses, Bronner & de Hoog (2010) have identified that consumers value information generated by ‘non-official’ sources as equal to information provided by a firm when making purchasing decisions; therefore, it is to the firm’s benefit to support both types of information generation (its own and its stakeholders).

Additionally, embracing open-access has the benefit of mitigating internal resource constraints. Once (typically unpaid) external stakeholders fully engage with the business model, the firm is no longer in the position of having to resource the business model alone. This is best illustrated by collaborative open-source software development that witnesses the power of capturing a large resource pool beyond any particular legal boundary. For-profit firms can similarly enjoy scale benefits. For example, in 2008 Procter & Gamble created an external relations program that engaged stakeholders in an open innovation process (Martin & Lafley, 2013). This

open innovation program was so successful that it facilitated evolution in the existing business model:

> this networked alliance of internal and external capabilities created a unique and powerful activity system (Martin & Lafley, 2013: p.27).

However, a consequence of embracing a complex adaptive business model, is that the firm's boundaries become highly opaque and it is difficult to fully identify the firm against its wider external environment. The interrelationships between the firm, employees, departments, divisions, customers, suppliers, individuals, etc. become so intertwined and co-dependent that easy separation becomes difficult, thus necessitating the concept of a 'boundary zone'. Over time, the boundary zone will increase in size. This occurs because a complex adaptive business model creates its own hierarchies that do not respect formal boundaries. For example, a lower seniority employee and an external interest group may establish an excellent working relationship, which is likely to lead to new stakeholder engagement. This multi-directional relationship benefits all parties including the overall business model but can have the highest direct impact on business model innovation [i.e. change] when optimally sized (Bouncken et al., 2015). Therefore from a firm or management perspective, regulating the boundary zone and the related broader ecosystem is likely to be extremely challenging.

6.3.2 Multiple possible outcomes for business models are created

This account of multiple possible equilibria in a complex adaptive business model context means that the business model will create many new possible outcomes and that some, but not all, will be achieved. The ability for the business model to create

new previously inconceivable possibilities is an important benefit of a complex adaptive business model.

The difficulty in a complex adaptive business model is that it is unrealistic or even impossible to predetermine which outcomes will be captured until a particular path has been travelled some distance and path-dependence has acted to remove previously open pathways or a path-breaking mechanism has been activated (Laudien & Daxböck, 2015). It is therefore true that at a certain point in the business model's evolution a future outcome may become discernible (i.e. a new product, solution, marketplace, etc.), but it is also true that forecasting or planning in a complex adaptive business model is highly unreliable.

Further complicating the ability to plan and forecast in a complex adaptive business model, is the fact that it has the capacity not only to continually create new possibilities, but also to capture *multiple outcomes* simultaneously. Unlike a traditional business model, outcomes will be achieved over a number of dimensions such as product or service evolution, stakeholder satisfaction, sales growth, profitability, resource utilisation, etc. Significantly, no one particular outcome should be seen as more important than another. This is very different from traditional success measures. Essentially it means that obscured value areas in a business model will be exposed by a complex adaptive business model. Finally, the capturing of one outcome is not, necessarily, mutually exclusive to capturing alternative outcomes. Simultaneous capture is likely and over time this potentially allows a complex adaptive business model to split, again mimicking a biological trait.

6.3.3 Co-evolution of a complex adaptive business model with its environment

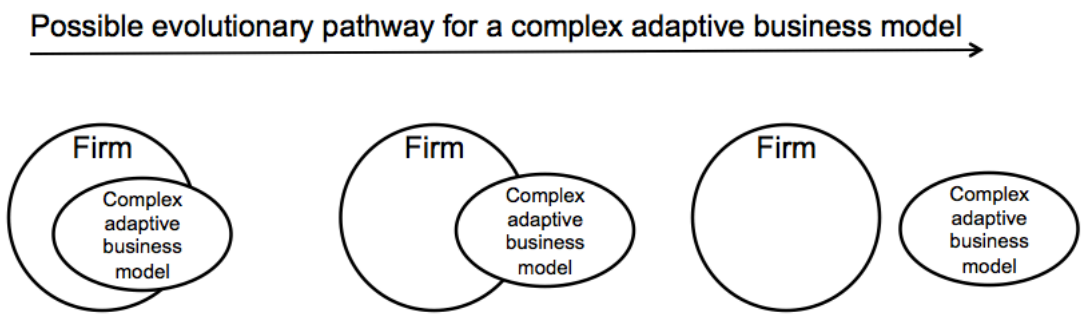
The ability for a complex adaptive business model to capture new opportunities results from the processes of feedback and adaptation and ultimately results in continued co-evolution (emergence) with its environment, including the firm. From the firm's perspective, the ability to evolve is important if we expect constant disruption to incumbent strategies and/or business models (Christensen, 1997; 2011). In this context, rather than a firm seeking to gain competitive advantage or possibly even achieve super-normal margins or profits, *organisational survival* might be an optimal outcome. This is a very different view of a firm and the purpose of its business model. From a strategy perspective, these implications have only been recently investigated through the lens of evolutionary or complexity strategy (e.g. Eisenhardt & Sull, 2001; 2012; Beinhocker, 1997; McGrath, 2013).

Co-evolution does not necessarily mean the firm and its business model will remain intertwined. As a complex adaptive business model itself adapts and evolves, the centrality of the firm in the business model may actually dissipate. It is even conceivable that at a certain point in its evolution a complex adaptive business model may detach from the firm altogether and essentially become 'stateless'. This is not an abstract notion. It is regularly witnessed in the open-source software sector. For example, where a firm makes a decision against the best interests of the overall development community it is acceptable for the software effort to 'fork' (a process where the underlying software code is contributed to an alternative development effort) leaving the firm stranded.[25] Indeed this situation can be witnessed in Oracle Corporation's open-source development of 'OpenSolaris' where the software

[25] This raises many legal implications including the treatment of intellectual property rights - which are outside the scope of this dissertation.

developers involved in the project reacted negatively to Oracle's decision to focus on a proprietary version of the software (Caulkins et al., 2013). Diagrammatically, this potential evolution is represented in Figure 32 below. I emphasise that this is only one of an almost unquantifiable number of possible evolutionary pathways and on many of these possible pathways the firm may become more central to a complex adaptive business model rather than less.

Figure 32: One possible evolution path for a complex adaptive business model



To ensure its long-term survival, a firm must therefore act in concert with the development pathway taken by its business model. A firm itself must be adaptable to change and made strategic decisions regularly, possibly following the mantra of 'strategy as simple rules' (Eisenhardt & Sull, 2001; 2012), an approach discussed in detail in the next subsection. For example, as a business model changes, a firm may choose to invest in establishing a new business model or exit a difficult market segment. It is less likely that large firms who have a successful, single business model will be as adaptable, as smaller firms or firms operating multiple business models, and they are therefore at higher risk of organisational failure. Firms who themselves resemble a complex adaptive system are less likely to be disrupted by changes in the macro environment.

6.4 Organising the firm to support complexity principles

6.4.1 Precursor strategic considerations

According to Foss & Saebi (2015: p.8) “a firm’s organisational design is an inherent part of a firms’ business model” and it is likely that this is a bidirectional, co-dependent relationship. However, both organisational design and a firm’s business model are also informed in deeper contexts. Before any changes are made to either the business model or the firm’s organisational structure, to support a complex adaptive business model or otherwise embrace complexity principles, management should first address three key precursor issues. Changes that are made without reconciling these issues are likely to lead to suboptimal, failed, or unexpected results.

First, the firm’s higher-level purpose must be clearly resolved by senior management. The purpose must clearly articulate why the firm exists and what value it intends to deliver to its stakeholders. There is a natural tendency, particularly in publicly-listed firms, to articulate a narrow purpose for the organisation. However, a wide purpose should be considered because this encourages the maximum innovation potential of the firm to be reached. From a complexity perspective, Nonaka (1988) indicates that a wide purpose acts to create maximum energy and chaos in the firm, which in turn will lead to innovation. At the same time, the firm’s purpose should also be specific enough so that it works to foster a unique organisational identity. Ensuring a unique identity through a shared purpose is important because as Nonaka (2007: p.163) highlights, a firm like an individual, can have a “collective sense of identity and fundamental purpose… which is the organisational equivalent of self-knowledge”. Developing a purpose that both explains why the firm exists and is simultaneously wide and unique is challenging. Senior management should therefore devote

significant resources to deeply understanding the firm itself, the marketplace, completion, stakeholders, and working through what the firm is, and could be.

Once a high-level purpose has been determined, an even greater challenge exists: introducing and embedding it into the firm and its operating environment. On the assumption that the firm is already operating, this means a process of dissolving the existing order and creating a new one must be undertaken (Nonaka, 1988). This is actually a fundamental issue because it is impossible for a firm to fully embrace complexity or operate a complex adaptive business model inside a historical purpose that continues to operate to restrict adaptation or emergence. Therefore, it is expected that developing and then embedding the firm's purpose deeply into the firm's conscience will take significant time and require extensive executive management involvement. Ultimately this investment is critical in a complexity driven organisation because the 'right' purpose will support a common and unified culture, which Stacey (1992) lists as one of four principles for organisational success in managing complexity.

Second, in concert with establishing its high-level purpose, the firm must prioritise developing and then supporting human relationships in everything it does. This is essentially a change in philosophy of what is most valuable to the firm and what should be invested in. Indeed, focusing on relationships is so important for managing complexity in an organisation that Lewin & Regine (2000: p.27) indicate that the capability to encourage and manage healthy relationships is the "new bottom line for business" and provide the following rationale for this perspective:

> In complex adaptive systems, how we interact and the kinds of relationships we form has everything to do with what kind of culture

> emerges – has everything to do with the emergence of creativity, productivity, and innovation (Lewin & Regine, 2000: p.16).

Similarly, Nielsen & Montemari (2012) emphasise through case study research the importance of relationships to the success of business models specifically. Therefore, supporting human relationships should be both the firm's primary focus and benchmark, against which success or failure of any initiative is ultimately measured. Implementing this perspective means that senior management will need to work with both internal and external stakeholders, to articulate how success will be defined in their own unique organisational setting and provide a translation between traditional metrics (used to measure performance) and those to be adopted that focus on human capital returns.

Third, the firm needs to focus on knowledge as its operational currency. Continuous knowledge gathering and the adaptation of knowledge through learning is a core principle of evolutionary economics and is an enabler of firm success, because learning and knowledge are drivers of economic success (Nelson & Winter, 1982). Data and reporting should therefore be oriented to support the firm understand its knowledge attributes and deficiencies; knowledge enhancement, through learning, should be acknowledged and rewarded. Knowledge should be considered akin to a tangible asset because it is a tradable item across the stakeholders of the firm and its complex adaptive business model: knowledge in one area may be traded for knowledge in another. In this context knowledge is not something that should be gathered and stored, protected or restricted, but instead used actively to make better decisions and thus achieve better outcomes.

6.4.2 Organisational design considerations

Once the precursor managerial considerations have been addressed and necessary requirements for complex adaptive business models to operate implemented (for example, empowering stakeholders, setting rules, and establishing boundaries), a number of further more tactical organisational design changes should be considered. I outline these below.

Flat organisational structure: a traditional firm structure is hierarchical and designed to provide control over all aspects of firm operations and decisions. Once a firm embraces complexity and empowers its employees to engage in its business model, this structure is less relevant. Instead, a flat organisational structure should be implemented. This does not mean reducing all levels of management, rather it implies establishing a structure that ensures every level in the firm is as close to the firm's external stakeholders as possible. This structure has four main benefits. First, it supports and reinforces empowerment of employees. Second, it ensures maximum equity in information flow and decision-making. Third, it ensures an optimal internal: external information flow. And fourth, it removes the potential for decision veto and thus alleviates restrictions on adaptation and emergence (i.e. innovation).

Delegate to and empower front line employees: Lieh et al. (2015: p.26) highlight that "firms with a high degree of delegation and vertical communication are often better at sensing and evaluating opportunities and threats". Picking up and responding to external signals of changes in the environment, is important for success. Therefore, actively fostering delegation and empowerment through organisational design is important and should be structurally implemented.

Purge old policies and practices: old policies, processes, and procedures are often followed for many years beyond when they should have been retired. Instead of allowing these routines to remain active, the firm should empower its stakeholders to constantly address what practices should no longer apply and actively retire them. A reward system should be implemented that incentivises employees to come up with more efficient procedures and a 'fast to try fast to fail' philosophy encouraged.

Built environment: the physical environment can be leveraged to support relationship development. Offices and facilities should therefore be designed to foster maximum human contact and engagement. There are a number of practical ways this can be achieved. For example, many high-technology firms provide staff canteens and lunchrooms and either provide or subsidise employee meals. Each meal is an opportunity for a new connection or relationship to be developed. Alternatively, employees can be encouraged to meet new colleagues through a ''random' allocation of desk space in an office environment.

Virtual environment: similar to designing a physical environment that supports relationship development, so too should the firm's virtual environment be designed. A platform for communication should be established that encourages ongoing interactions between stakeholders of the firm (and the complex adaptive business model) in a dialogue based mode. Similarly the firm's website should be 'open' and structured as a communication platform. The firm should encourage maximum use of social media, accept negative reviews may follow, and ensure employees are empowered to resolve issues and address concerns on a real-time basis.

Reduce email as much as possible: consistent with the design of the firm's virtual environment, the firm should encourage minimal email use. Email is a

communication medium that is both asynchronous and essentially closed to many interested parties. Instead, moving to a different messaging platform as that is akin to 'Facebook' will encourage positive interactions and ensure that knowledge sharing is easy and visible.

Adopt video gaming principles: many principles resident in the video game industry can be applied to an organisation that supports complexity. For example, employees should be able to acknowledge other employees (or stakeholders in the business model) expertise by through 'likes' or 'badges'; this concept can also be linked to the performance review system. Similarly, individual projects or initiatives can be treated as games with levels and team rewards. Teams should even be able to challenge one another and membership of each team should be open.

Hire diversely: instead of the traditional employee recruitment process run by human resources, all recruitment should be performed commencing from recommendations internally or externally gained with a focus on gaining maximum diversity in the firm. To ensure organisational fit, the potential candidate should meet members from multiple organisational areas. Finally employees should be hired on likely future performance and their willingness to 'give things a go' rather than historical performance or educational levels.

Encourage social activities: a firm that supports its stakeholders in engaging in social activities is providing an environment that is open, collaborative, and positive. In addition, people have different strengths, which can be displayed in different settings. By maximising the potential settings for employees to engage the firm will also ensure its staff can display their talents widely and different leadership attributes may be demonstrated. Ultimately, social activities combined with work activities helps

employees develop trust between one another, which in turn enables better decision making and relationship development.

Build critical mass quickly: where a new project is being commenced or initial results indicate a potential opportunity is emerging, the firm should encourage critical mass quickly. This can be achieved by publicising results, highlighting team success, seeking employee volunteers, etc. The firm should encourage external participants to join the initiative and develop rewards that incentivises the scaling of the initiative external to the firm.

Cross-functional teams: all teams should contain cross-functional representation and should not be mono-functional. While the main expertise might apply to one core function, other functions as diverse as human resources, sales, and manufacturing, should also be represented to ensure trade-offs are not made that have unintended consequences and that opportunities for knowledge sharing are not missed.

Simulate the behaviour of the whole system: replace legacy forecasting tools and techniques that focus on components of the system and instead develop a capability to model the entire system (e.g. the entire complex adaptive business model) to help predict overall outcomes. The modelling should focus not only on averages but also on rare events, because rare events offer unparalleled risk and opportunity for the firm.

Develop data expertise that focuses on insights: the amount of data a firm or even a complex adaptive business model generates is massive. The firm should therefore work to establish expertise in data assessment and analytics and actively seek to discover new insights from the data created. Specific analytical tools should be developed to focus providing insights, which in turn may turn into knowledge.

External participants should also be invited to participate in generating insights from the firms' data – and much of the firm's actual data (i.e. the database) should be made 'open' access for this purpose.

Focus and reward research & development: a business model, in particular, must deliver something of value to stakeholders. The value must be more than just a branding exercise – it must develop something unique. Therefore, focusing on research and development is important. The firm should ensure a continual investment in research and development and invite external participants into the core of the development effort. The 'fast to try fast to fail' philosophy embedded in the firms' reward systems should be particularly targeted to research and development activities. Initiatives that fail should be seen as 'learning' opportunities

6.5 Enhancing extant business model literature with complex adaptive business models

In Chapter 2 I reviewed extant business models. I have outlined how the existing literature can be parsed into a *mainstream perspective* and an *evolutionary perspective* on business models. A key difference between the two is how the business model is conceived to respond to constant external environmental change. In this regard, Casadesus-Masanell & Ricart (2010) represent the mainstream and convey a linear process for changing a business model where strategic decisions are made top-down and the outcomes are known in advance. Fundamentally this means business models are simply a vehicle through which long term strategic planning is realised. Casadesus-Masanell's (2012) definition for a business model is thus insightful because it describes a business model in this manner: simply as a reflection of a firms' 'realised strategy'. Conceptually this neatly aligns with perceiving

the business model as a type of model (Baden-Fuller & Moran, 2010) controlled by the firm and that can be changed at will. However, by *problematising* the *mainstream perspective* in its entirety (in Section 2.2.3), I have identified that this perspective is only appropriate when a business model is conceived as static, valid only at a point in time and/or when the external environment can be controlled.

In contrast, the *evolutionary* perspective does not expect business models to remain static. Instead it expects business models to constantly iterate, over time, in order to respond to a continually disrupted environment (Christenson, 1997; Johnson et al., 2008; Christensen & Johnson, 2010; Kagermann et al., 2011). However, the *evolutionary* perspective itself is nascent. Significantly, it has not yet determined how such business model change is achieved, particularly for mature operational business models. Here, one proposal is that a business model changes by following simple strategic rules (Eisenhardt & Sull, 2001). Another proposal sees the business model being changed through proactive innovation efforts (Chesbrough, 2010). Yet another proposal situates business model change in an experimentation context and uses evolutionary learning as a larger change framework (e.g. Sosna et al., 2010). None of these proposals are mature.

Therefore, neither the *mainstream* nor the *evolutionary perspective*s adequately encapsulates how business models change themselves without managerial intervention. This is a major gap in our knowledge because, as Laudien & Daxböck (2016) have found, the *majority of change* in a business model is emergent and driven from the bottom up *viz*. through the business model itself. In fact, Laudien & Daxböck (2016) identify that senior management only recognise a change once it reaches a point of maturity. My results indicate this occurs in Cisco too. For example,

in Section 5.4.6 I identify that Cisco's corporate planning operates to formalise a change in business model *ex post* as identified by Chesbrough (2010):

> Business model innovation [i.e. change] is not a matter of superior foresight ex ante – rather it requires significant trial and error, and quite a bit of adaptation ex post (Chesbrough, 2010: p.356).

In the above quotation, I interpret 'adaptation ex post' to mean the firm adapting to the change the business model has generated and this still renders senior management as 'non-active' makers in the overall process of change formalisation.

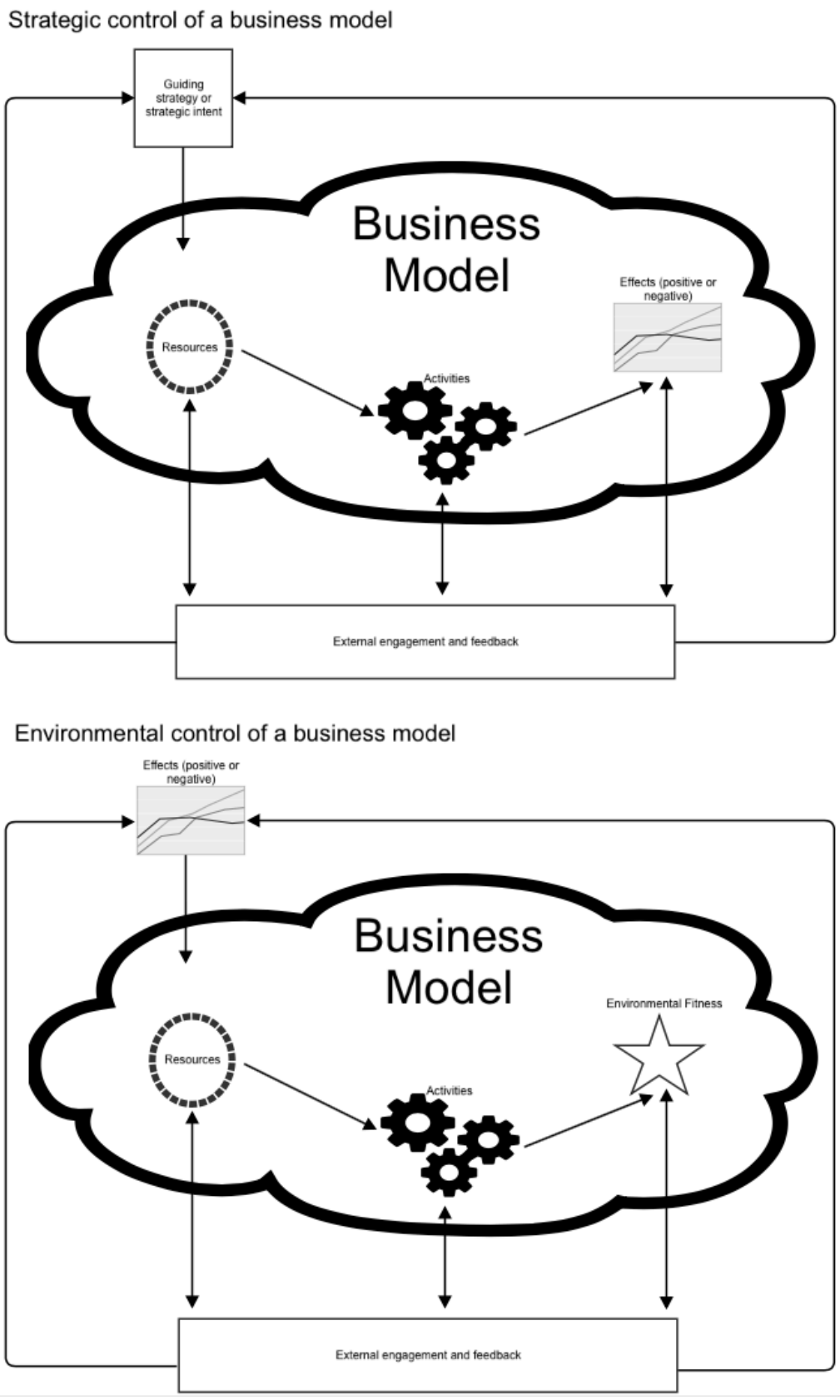
I use complexity science and the overall notion of a complex adaptive system as an analogy that explains how business models achieve such change outcomes in absence of any specific directive. Here, economists (e.g. Arthur, 1989; 1994; 1996; 2013; Foster, 2000; Beinhocker, 2006; Gintis, 2006; Levin, 1998; Holland, 2013) and strategy researchers (e.g. Beinhocker, 1997; 2006; Sargut & McGrath 2011, Brown & Eisenhardt, 1998) have already recognised that the way the economies and firms operate resemble complex adaptive systems. My proposal simply builds on these observations and identifies a new complex adaptive system in the form of a business model.

However, while my proposal augments the evolutionary perspective, it simultaneously challenges the notion that the firm is in control of the developmental path of its own business model and this means ultimately control over its own strategy and even destiny. For example, both the mainstream and evolutionary perspectives on business models assume (one specifically, one tacitly) that senior management have a high level of control over the developmental path of the business model. Therefore while a complex adaptive business model can

automatically reconfigure itself that does not mean it will change to generate any necessary competitive advantage to the firm – and this is a fundamental, probably insurmountable, problem for the mainstream perspective but also a major challenge to the evolutionary perspective. Indeed, this is possibly why McGrath (2010; 2013) indicates that any competitive advantage a firm may capture through its business model will not last. The implication is that as advantage degrades, the business model must be reconfigured. Based on Martins et al. (2015), I have called this achieving a continuous dynamic fit with the external environment over time.

Figure 33 illustrates the difference between purposeful strategic direction of a business model as assumed in the *mainstream perspective* and to a lesser extent in the *evolutionary perspective* and contrasts it with full environmental control of the business model via ongoing environmental feedback, as assumed in a complex adaptive business model.

Figure 33: Strategic versus environmental control of a business model



Source: author.

Finally, I should highlight that I focus primarily on the literature that addresses how *operational* business models change. For example, while I have indicated a lower role for senior management in a complex adaptive business model, senior management *will always be in the best position* to launch, shutter, or start a new business model.

6.6 Summary

The notion that business models function analogously to complex adaptive systems involves changing assumptions that attach to the concept viewed from the *mainstream perspective* on business models. This includes moving from a closed- to an open-system perspective, accepting the business model will be in a constant state of change, and accepting that business model development will be non-linear and unpredictable. In turn, for firms seeking to establish or support a complex adaptive business model, the concept also implies that the way the firm itself is conceived and designed may need to be adjusted to support complexity principles. Further, it involves accepting that the firm's control over the business model may be limited to that of guiding and influencing its development. Importantly the practice of management (as it relates to a complex adaptive business model) may need to be rethought. Instead of a top-down hierarchical style, which favours command-and-control, a possible future managerial imperative may need to be orientated around empowerment, enablement, and engagement.

Alternative measures of success will also be required; stakeholder satisfaction with their relationship with the firm and the business model will become very important. This means the role of the firm relative to 'its' business model will be challenged.

Instead of owner, it may become a facilitator. Firms that can adapt to this new highly dynamic reality have a higher potential for ongoing survival, whilst rigid firms using traditional business models may struggle. Paradoxically, embracing a complex adaptive business model may also enable a firm itself to become adaptable over time; as a complex adaptive business model changes shape so too can a firm either in concert with it or separately.

7 CONCLUSION

The top research priority for business model scholarship is to understand how change and evolution occurs in business models (Wirtz et al., 2015). My own research is aligned to this priority and I expressly focus on a situation where certain business models change by themselves – over time – without the need for explicit firm direction or intervention. This situation is significantly different from changes to a business model resulting from explicit executive action or the implementation of a detailed strategic plan. It is also different from changes that result from intentional business model innovation (Chesbrough & Rosenbloom, 2002; Chesbrough, 2007; 2010; 2013), or when changes are required in order to respond to a crisis in the firm and/or its business model; for example, when the firm is unable to fund costs associated with operating its business model. Finally, the situation I address is also different from when changes to a business model can be associated with the implementation or acquisition of a new business model.

In contrast, I focus solely on operational (i.e. established) business models and I embrace a strategy-as-practice lens that focuses my attention on the *actions, practices, praxis* of *practitioners* (Jarzabkowski, 2005; Whittington 2006; Paroutis et al., 2013; Golsorkhi et al., 2010; 2015). Ultimately, through this lens I seek to understand the *linkage* between the everyday decisions and actions of practitioners involved with a business model and its consequential macro level changes.

7.1 Contribution

For the last thirty years, the overriding purpose of conducting research in management and organisation studies has, almost without exception, been to "contribute to theory". This unrelenting emphasis has been criticised recently. For

example, and relative to the social sciences, Hambrick (2007: p.1342) has argued that management has a “theory fetish” while Shapira (2011) has argued that the word ‘theory’ itself is misused and has led to an undue focus on ‘theoretical’ contributions. Somewhat perversely, over the same thirty year period, the discipline has actually *not* generated a large number of really impactful contributions that meet Lewin’s (1951) expectation that for a theory to be good it must be useful (i.e. practical) in the “non-laboratory world” (Greenwald, 2012: p.99). To address this problem, Corley & Gioia (2011) counsel that for research to count as a theoretical contribution, it should do two critical things: it should provide *insight into a phenomenon*, and it should *advance knowledge* in a *useful* way.

The emphasis above on contributing to knowledge rather than to theory is significant because Shapira (2011) highlights that there are various stages in developing a ‘whole theory’ and a contribution at each stage of development is valuable in its own right. Nonetheless, generating interesting findings or contributing to knowledge generally is insufficient. Unlike cognate disciplines such as economics or sociology, management and organisational studies holds itself accountable to a dual purpose: providing *contributions* that also have prac*tical application* in industry (Van de Ven, 1989). In other words, whether in the form of a ‘whole theory’ or in the form of knowledge that helps develop a theory, contributions must be useful *for practitioners*.

Following Corley & Gioia (2011) and Van de Ven (1989), my contribution meets their critical litmus test insofar as I do provide insights into a phenomenon and I do advance knowledge in a way that is useful for practitioners. My ability to do this has been greatly enhanced by generating my research question through *problematizing*

existing notions of business models rather than through a purely *gap-spotting* approach (Alvesson & Sandberg, 2011; 2013).

Problematization can be depicted as a systematic critical look at the perceived wisdom at a paradigmatic level (Alvesson, 2015). This is accomplished by "illuminating and challenging underlying assumptions on a specific subject matter" (Alvesson & Sandberg, 2011: p.254). My chief contribution is that I have *problematized assumptions* that underlie the *mainstream perspective* on business models. I have identified that the term 'business model' is a 'field assumption' because practitioners (and even many scholars) do not fully understand what it means or includes. I have identified a 'root metaphor' assumption that sees business models as synonymous with mainstream strategy. I have also identified that key neoclassical 'paradigmatic assumptions' in the *mainstream perspective* are incompatible (Okhuysen & Bonardi, 2011) with observable phenomena in the 'real' economy.

I have further highlighted that when operational business models evolve *by themselves* in response to external stimuli without specific managerial intervention, extant *business model theory* cannot adequately account for why or how this occurs *in practice*. Significantly, this is a situation that impacts daily on practicing managers at all levels of a firm. According to Corley & Gioia (2011), determining how this phenomenon occurs is particularly 'useful' because it relates directly to *a real-life problem*.

7.1.1 Insight into business model phenomenon

My critical insight is that I have established that certain operational business models function analogously to complex adaptive systems. The two defining features of

complex adaptive systems witnessed in their ability to process feedback and display emergence, is the mechanism that enables them to independently change their own structure(s). To support my insight I have demonstrated, empirically, that Cisco's business models contain six key characteristics of complex adaptive systems, namely agents, rules, boundaries, feedback, adaptation, and emergence. Not only have I identified the existence of these characteristics, but I have also identified their applied manifestation. For example, I identify positive feedback in Cisco's business models is manifested in high growth rates, competitive lock-out, market dominance, and setting the customer buying preferences for 'Cisco branded' solutions. Similarly, I identify negative feedback is manifested in control activities such as listening to customers, monitoring activities, and assessing the business model's financial results. I have provided such examples for each of the six characteristics mentioned above. Consequently, and significantly, I have also confirmed Eisenhardt & Sull's (2001; 2012) earlier findings that Cisco follows a number of 'simple strategic rules' to manage a complex environment.

7.1.2 Advancing knowledge in business model theory

I have advanced knowledge in business model theory in the following way. As stated, extant theory is unable to satisfactorily explain how operational business models have the capability to change themselves in response to external stimuli. I provide this explanation by extending the evolutionary perspective and grounding the notion of a complex adaptive business model in complexity science. As part of this grounding, I have highlighted the utility of complexity theory for explaining change in systems such as an operational business model. More specifically, I have outlined the detailed characteristics of complex adaptive systems themselves and I have confirmed their presence in related systems such as the economy and firms. I have

also emphasised that *complexity economics* and *emergent and/or contemporary strategy* have incorporated key complexity science principles into their own theoretical constitution(s), strengthening the theoretical relationship between the *evolutionary perspective* and complex adaptive business models.

Identifying such an alternative conceptual location for business models that explains how operational business models evolve in a real-world environment and that also reconciles problems with the *mainstream perspective* is challenging. Here, Okhuysen & Bonardi (2011) stress the importance of demonstrating a relationship between the existing and proposed research areas. Therefore, in proposing complexity science for explaining how certain business models change themselves, I have highlighted the direct relationship between the neoclassical paradigm and complexity science for business models by demonstrating how *existing characteristics* of business models (such as their incorporation of multiple stakeholders) *are compatible* with characteristics of complex adaptive systems. This analysis is undertaken at multiple levels using existing conceptual frameworks so as not to strain logical possibilities (Okhuysen & Bonardi, 2011: p.10). Clearly demonstrating this interrelationship is important because for research to be 'interesting', a litmus test is that the proposal "should fall somewhere between what is regarded as obvious and absurd" (Alvesson & Sandberg, 2011: p.259).

Extending the evolutionary *perspective* through complexity science is *not obvious* at first. However, once the characteristics and mechanisms of complex adaptive systems are adequately understood, they provide a clear and theoretically-grounded explanation for how operational business models can evolve *in practice.* Importantly this new knowledge is both useful and observable (i.e. obvious) when practitioners

understand what to look for when assessing whether a complex adaptive business model exists in their own context(s). In this regard, and as outlined, I provide a contribution through *insight* into a phenomenon and *advance knowledge* in a way that is *useful for practitioners*.

7.1.3 Transferability of research findings

My dissertation finds empirical evidence that each characteristic of a complex adaptive system is evident in Cisco's two largest and most important business models; these findings are based on case study research. Although some scholars criticise case studies for providing results that are less generalisable than quantitative research (Tsang, 2014: p.370), *I do not seek to generalise my findings*. Instead, my ambition is to establish the initial theoretical viability for the concept of a complex adaptive business model and determine whether it can be empirically supported in a real-world context. Essentially I seek to provide a justifiable theoretical foundation for my proposal and to *generate results that may be transferable* (Eisenhardt, 1989; Aken, 2004) to Cisco's peers within the high-technology sector. In essence, I align albeit with a narrower ambition with Gioia et al. (2013: p.24) who state the following about single case settings such as my own:

> Our stance here is a strong rejoinder to the old argument that it is not possible to generalize from small samples—perhaps *especially samples of one,* as some believe case studies to be. Is it possible to generalize from a case study? Of course it is—if the case generates concepts or principles with obvious relevance to some other domain

Eisenhardt (1989: p.532) further highlights that case study research is “especially appropriate in new research areas” such as mine because a case study can tightly link findings to data. Case studies are also valuable in a single research setting such as that considered in my dissertation because they “allow researchers to tease out ever-deepening layers of reality in the search for mechanisms and influential contingencies, and to peer into the box of causality” (Gerring, 2014: p.379). For this to be achieved, Eisenhardt (1989) has further outlined that a prerequisite is the researcher must have a clear focus when performing the investigation. The particular focus of my research was to assess Cisco’s operational business models. The case study itself was designed following advice from Yin (1998); in particular, the case study included multiple cases (business models) and used multiple methods to gather data. According to both Yin (1998) and Eisenhardt (1989), adopting this structure has two benefits. First, the possibility that results can be replicated in further research is increased. Second, the empirical validity of any findings, including those I have provided are enhanced.

However, not all business models employed in the wider economy can function analogously to a complex adaptive system. So, in Section 3.3, I provide a discussion of why the high-technology sector has – and other sectors do not have – a structural architecture that enables firms to achieve increasing returns through their business models. Increasing returns have been directly equated to feedback in a complex adaptive system (Arthur, 1996) and lead to the possibility that complex adaptive business models may be situated more broadly in the sector. Nevertheless, for the findings of this research to be transferrable beyond Cisco and into the wider sector or field, Cisco itself must resemble its peers in important ways.

In this regard, Cisco is one of the original and largest high-tech firms. It is considered both as a 'proxy' for the entire sector's financial health and also a 'bellwether' for future sector demand (Clark, 2015). The reason that Cisco is seen as representative of the high-technology sector is due to the level of integration Cisco shares with its peers. For example, Cisco has at least 129 direct competitors, 3000 direct suppliers, and 40,000 partners globally (Cisco Partner Group, 2010). Through these interdependent relationships, the firm spans the full set of activities indicated by Richardson (1972: p.898) in that it co-operates, co-ordinates, competes, and complements its sector peers in a "complex network of relationships". Cisco thus shares key similarities with many sector participants such as the ability to coordinate and communicate – even when it specialises in some *activities*.

This does not mean that Cisco is identical or indistinguishable from other firms in the sector, nor that it lacks discretionary strategic choice. Cisco and its peers retain different strategies, market positioning, and value propositions, and these inter-firm differences are economically significant (Nelson, 1991).[26] However, notwithstanding these differences, similarities remain in higher-level areas such as aspects of firm culture contributed from society at large, similarities in employee base in areas as education levels and socio-demographic characteristics, technology adoption levels, process similarity, approach to corporate governance, ownership structures, etc.

The level of similarity and difference between firms in the sector may be related to the maturity of the high-technology sector itself. DiMaggio and Powell (1983) indicate that as a field (i.e. a sector) matures into a 'structured field', all organisations will become indistinguishable:

[26] Interestingly this observation forms part of Nelson's broader critique of neoclassical economics.

> Organizations in a structured field, to paraphrase Schelling (1978: p.14), respond to an environment that consists of other organizations responding to their environment, which consists of organizations responding to an environment of organizations' responses (DiMaggio & Powell, 1983: p.149).

Their description of a structured field aligns with Arthur's (1996) categorisation of industries only able to generate negative returns (i.e. industries operating in a near-equilibrium state). In contrast, Arthur indicates that the high-technology sector is significantly different to these mature industries. Indeed, the high-technology sector's comparative immaturity is evident because it exhibits continual major change – often on a daily or monthly basis. These changes are usually public and reported by the media in depth. Nevertheless, the forces identified by DiMaggio and Powell (1983) that precipitate homogeneity apply to Cisco and its peers. That is, since the sector's inception, they have been subject to forces of *isomorphic change* both externally applied (e.g. through laws and technical standards) and internally (e.g. copying one another's corporate structures and hiring policies). The resultant similarities today are evident and Table 27 on the following page is provided to highlight examples of the high-level similarities between a selected group of high-technology firms, including Cisco.

Table 27: Selected high-level similarities between selected high-technology firms

Similarity	Cisco	Apple	Oracle	Amazon	Facebook
Head office within 30 miles of two or more compared firms	x	x	x	-	x
Published business rules	x	x	x	X	x
Same laws apply (same federal &/or state laws)	x	x	x	X	x
Regulations (same accounting &/or share-market rules)	x	x	x	X	x
CxO or board level contains employees with peer firm experience[27]	x	x	x	X	x
Competes against all compared firms[28]	x	x	x	X	x

Ultimately the high-level structural similarities shared by sector participants provides the necessary scope for the results of this dissertation to be transferred beyond Cisco to its sector peers.

7.2 Research limitations

My research seeks only to establish an initial theoretical foundation for extending the *evolutionary perspective* on business models and conceptualising business models in complexity science, as a type of economic complex adaptive system. I do not seek to *directly define* business models as complex adaptive systems. Rather I seek to propose that operational business models function in a way that is *analogous* to them. The word analogous is a small but significant inclusion in my proposal and follows advice from organisational complexity scholar, Ralph Stacey (2007; 2011),

[27] For example; Cisco's board member Michael Capellas previously worked for HP. Apple's board member Dan Riccio previously worked for Compaq (HP). Oracle's board member Joanne Olsen previously worked for IBM. Facebook's board member Reed Hastings previously worked for Microsoft. Amazon's board member Diego Piacentini previously worked for Apple.

[28] Note: Facebook 'competes' in the hardware market through its 'Open Compute Project' See: http://www.opencompute.org

that it is potentially invalid to simply apply principles from the natural sciences to the social sciences.

Further, my research reflects a single firm, albeit broadly representative of its peers in the high-technology sector. My research therefore does not seek to provide results that are widely generalisable but instead seeks to provide results that are transferable (Eisenhardt, 1989; Aken, 2004) to Cisco's peers in the high-technology sector. In addition, my research has not generated results against a quantitative or statistical threshold. Instead, my research has sought to generate insight from its research participants using a qualitative research design. My research is also limited by its assumptions both explicitly stated (e.g. participants in a complex adaptive business model must be empowered) and implicit in my own choices (e.g. selection of epistemology, methodology, etc.) and background (e.g. culture, etc.). Finally, while I have recognised the potential for introducing personal bias into my research through my relationship with Cisco and have acted to minimise its potential impact, it is possible that has been introduced unknowingly or unintentionally.

7.3 Further research

While I have commenced the initiative to conceive business models as analogous to complex adaptive systems further research is recommended. Specifically, I suggest that research should focus on whether the characteristics of complex adaptive business models are evident firms other than Cisco and/or different types of firms entirely (e.g. not for profit firms). Future research could also address whether complex adaptive business models are identifiable in industry sectors other than the high technology sector in which I have located my research. Further, while I have

utilised a qualitative methodology, such potential further research may be qualitative or quantitative.

Alternatively, further research could focus on the detailed organisational implications I indicate in my discussion. It is early days and whether or not complexity science is an appropriate area in which to locate business models or indeed whether complexity principles should even inform management practice(s) at all. This is a significant unknown area containing many interesting research opportunities.

7.4 Final thoughts

Ultimately business models, as a prime system through which firms participate with the economic and social system(s), should be designed and/or operated on assumptions that accurately reflect the actual characteristics of the systems in which they operate. The *evolutionary perspective* on business models in which I have located my proposal for complex adaptive business models seeks to respond to this imperative. Consequently, the *evolutionary perspective* expects business models to interact in an economy that is constantly changing and therefore unpredictable, and unstable. To achieve a *continuing dynamic fit* with the environment and indeed the firm itself, business models are also expected to remain in a constant state of change. While not guaranteed by adapting and evolving as conditions change a business model can help the firm survive over time. Counter-intuitively, a highly attuned business model may even deliver superior financial returns and competitive advantage to the firm for a period of time. However, the *evolutionary perspective* expects this advantage to be temporary or transient (McGrath, 2010; 2013) and easily disappear as the economic and/or social system(s) reorder.

One implication of having to maintain pace of change at least equivalent to the speed of change in the environment, is that strategic or operational decision-making cannot remain concentrated in the executive levels of the firm. Large and successful firms operating in the high-technology sector have already necessarily delegated substantive decision making to their operational layers, because delays in decision outcomes simply cannot occur when the firm is forced to change constantly (and often simultaneously on multiple dimensions). Moreover, operational-level employees situated at the edge of the firm are arguably located where the best sense making of the changing environment can occur (Regnér, 2003). Significantly, once such delegation has occurred senior leadership is in an improved position to focus on higher order priorities; these can easily be overlooked when executives focus on short-term issues. Higher order priorities include determining and widely embedding its purpose, culture, and definition of success. Following this, senior management can then focus on establishing guiding strategic frameworks, sponsoring and supporting change throughout the firm, and developing and supporting its human capital. In this regard, one analogy is managing a high performing sports team, where leadership encourages the 'best' person into every position and supports them so they can deliver high performance. Netflix, for example, adopt this very analogy:

> We're like a pro sports team…coaches' job at every level of Netflix are to hire, develop, and cut smartly, so we have stars in every position (Netflix, 2009).

In essence, Netflix has implemented a complexity principle into the fabric of the firm. However, possibly more extensive adjustments may be required to fully embrace and support a complex adaptive business model. For example, structural changes may

include adjusting the hierarchy of the firm in order to empower all staff. It may also require ensuring explicit support for external participants involved with the business model, even to the extent of working with competitors. Tactical organisational changes may also be necessary. To that end I have recommended a number of proposals that may be implemented. These range from adjusting the physical and virtual environments of the firm, to embracing principles from video gaming that help to facilitate high levels of interpersonal collaboration.

Ultimately, however, the largest adjustment needed may be that of perception: the firm and its management may need to recast themselves from being an owner and controller of 'their' business model to a 'facilitator' or 'custodian' of the business model and its evolutionary path over time.

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APPENDIX 1: List of business model definitions

Definitions of definitional categories in order of comprehensiveness and completeness:

- **Economic theme:** represent definitions that focus on how the company makes revenue or profit.
- **Value theme:** represent definitions that focus on abstract views of how value is created (and captured) by firms.
- **Interdependencies theme:** represent definitions that highlight non-visible interdependencies that exist in an organisation and by implication must be exploited in order to be successful.
- **Architecture theme:** represent definitions that seek to describe the end-end structure of a firm related to its business model.
- **Integrated theme:** represent definitions that seek to synthesise the concept in its totality.

Definition Category	Operative variable in definition	Definition	Author(s)
Architecture	Blueprint	A business model is ultimately a blueprint even a recipe that fulfils important functions such as enabling description and classification.	Demil & Lecocq, 2010
Architecture	Blueprint	We describe the business model's place in the firm as the blueprint of how a company does business. −It is the translation of strategic issues, such as strategic positioning and strategic goals into a conceptual model that explicitly states how the business functions. −The business model serves as a building plan that allows designing and realizing the business structure and systems that constitute the company's operational and physical form	Osterwalder et al., 2005
Architecture	Components and linkages	A business model is the total architecture of the firm made up of a set of components and linkages reflecting the firm's choices	Hurt, 2008
Architecture	Product, Service & Information flows	A business model is architecture for the firm's product, service and information flows.	Selz, 1999
Economic	Profit	A statement of how a firm will make money and sustain its profit stream over time	Stewart & Zhao, 2000
Economic	Making	Method by which a firm builds and uses its	Afuah &

	Money	resources to offer its customers better value than its competitors and to make money doing so. It details how a firm makes money now and how it plans to do so in the long term.	Tucci, 2002
Economic	Organizational and financial architecture	Business model is a plan for the organizational and financial 'architecture' of a business. −This model makes assumptions about the behaviour of revenues and costs, and likely customer and competitor behaviour. −It outlines the contours of the solution required to earn a profit, if a profit is available to be earned	Teece, 2007
Integrated	Heuristics	A successful business model creates the heuristic logic that connects the technical potential with the realisation of economic value	Chesbrough & Rosenbloom, 2002
Integrated	Stories	Business models are at their heart stories - stories that explain how the enterprise works	Magretta, 2002
Integrated	N/A	The totality of how a company selects his/her customers, defines and differentiates his/her offerings (or responses), defines the tasks it will perform his/herself and those it will outsource, configures his/her resources, goes to the markets, creates utility for customers and captures profits	Slywotzky, 1995
Integrated	N/A	The architecture of a firm and its network of partners for creating, marketing and delivering value and relationship capital to one or several segments of customers in order to generate profitable and sustainable revenue streams.	Dubosson-Torbay et al., 2002
Integrated	N/A	An architecture for the product, service and information flows, including a description of the various business actors and their roles; and −A description of the potential benefits for the various business actors; and −A description of the sources of revenues	Timmers, 1998
Integrated	N/A	Business model is a reflection of a firms realised strategy	Casadesus-Masanell, 2012
Integrated	N/A	A business model is the logic and	Rohrbeck et

		architecture of the economic and societal value creation and value capture system	al., 2013
Integrated	N/A	An architecture for the product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues.	Burkhart et al., 2011
Integrated	N/A	A business model is a concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets.	Morris, 2005
Integrated	N/A	A business model describes the rationale of how an organization creates, delivers, and captures value	Osterwalder et al., 2010
Integrated	N/A	The business model describes the system of interdependent activities that are performed by the firm and by its partners and the mechanisms that link these activities to each other	Zott & Amit, 2013
Integrated definition	N/A	Decisions enforced by the authority of the firm	Casadesus-Masanell & Heilbron, 2015
Interdependencies	Entities & their relationships	Abstract representation of reality that defines a set of entities and their relationships… commonly describes the linkage between firm's resources & functions and environment	Mansfield & Fourie, 2004
Interdependencies	Interrelated components	Business Models consist of 4 separate but interrelated components −A set of elemental activities. −A set of organizational units that perform the activities (some of these units are internal to the firm, others external). −A set of linkages between the activities, made explicit by an isomorphic set of physical transactions (between the organizational units that perform the activities) and human relationships among the individuals who supervise and/or manage the linked organizational units. - A set of governance mechanisms for	Santos, 2009

		controlling the organizational units and the linkages between units.	
Value	Creating Value	A business model strictly speaking is the organisations core logic for creating value	Linder, 2001
Value	Value Proposition	A business model outlines the essential details of a firm's value proposition for its various stakeholders and the activity system the firm uses to create and deliver value to its customers. If Porter [1996, 2001] is used to define strategy, a business model may be defined as an abstract representation of some aspect of a firm's strategy. However, unlike strategy, business models do not consider a firm's competitive positioning	Seddon, 2004
Value	Creating Value	Business model is made up of four interlocking elements that taken together can create and deliver value; 1. Customer value proposition (most important) 2. Profit formula 3. Key resources 4. Key processes	Johnson et al., 2008
Value	Logic of firm	The logic of the firm, the way it operates and how it creates value for its stakeholders	Casadesus-Masanell, 2010
Value	Questions	Business Models comprises the combined elements of ``who'', ``what'', ``when'', ``why'', ``where'', ``how'' and ``how much'' involved in providing customers and end users with products and services	Mitchell, 2004

APPENDIX 2: List of business model antecedent theory

Antecedent Theory	Reference	Classification: Mainstream and/or evolutionary perspective on business models
Adaptive cycle	Miles & Snow, 1978	Evolutionary
Business as an open system	Petrovic et al., 2001	Evolutionary
Business idea	Normann, 1997	Evolutionary
Business-webs	Tapscott et al., 2000	Evolutionary
Choices on firm's boundaries	Barney, 1999	Mainstream
Co-operative strategies	Dyer & Singh, 1998	Mainstream & Evolutionary
Complementarities	Brandenburger & Nalebuff, 1997	Mainstream & Evolutionary
Core capabilities	Stalk, Evans, & Shulman, 1992	Mainstream & Evolutionary
Core competencies	Prahalad & Hamel, 1990	Mainstream & Evolutionary
Cultural webs	Johnson, 1987	Mainstream & Evolutionary
Decision making model	Cyert & March, 1963	Evolutionary
Dominant logic	Bettis & Prahalad,1995	Mainstream
Dynamic capabilities	Teece, 1997	Mainstream & Evolutionary
Evolutionary theory	Nelson & Winter, 1982	Evolutionary
Flexible strategic decision making	Shimizu & Hitt, 2004	Mainstream & Evolutionary
Industry recipe	Spender, 1989	Evolutionary
Inter-organisational systems	Stahler, 2002	Evolutionary
Internal components linked to external environment	Learned, Christensen, Andrews, & Guth, 1969	Mainstream & Evolutionary
Internal resource combinations and management of organisation	Penrose, 1959	Mainstream
Linkages to other networks	Dyer & Singh, 1998	Mainstream & Evolutionary
Organisation as system and sub-systems	Hatch, 2000	Mainstream & Evolutionary
Organisation character and identity	Andrews, 1980	Mainstream & Evolutionary
Organisational	Jacobides & Billinger, 2006;	Mainstream &

boundaries	Santos & Eisenhardt, 2005, 2006	Evolutionary
Organisational structure	Chandler, 1962	Mainstream
Organisations as a bundle or resources	Amit & Shoemaker, 1993; Grant 1991	Mainstream
Resource advantage theory	Hunt, 2000	
Resource-based theory / view	Wernerfelt, 1984; Barney et al., 2001	Mainstream
Socially complex resource combinations	Potgieter, April, Cooke, & Lockett, 2006	Mainstream
Strategic management science	Drucker, 1954, 1959	Mainstream
Stream of actions	Mintzberg, 1987	Evolutionary
System thinking	Senge, 1990	Evolutionary
Transaction cost economies	Williamson, 1981	Mainstream
Value chain	Porter, 1985; 1996	Mainstream
Value creation in networks	Schumpeter, 1936	Evolutionary
Value nets	Brandenburger & Nalebuff, 1999	Mainstream & Evolutionary
Value networks	Hamel, 2000; Li & Whalley, 2002; Jarillo, 1985	Evolutionary
Value webs	Selz, 1999	Evolutionary

APPENDIX 3: Characteristics of complex adaptive business models

The appendix contains two sections. The first is a restatement of the adopted complex adaptive business model characteristics from Section 3.2. The second is an expanded set of complex adaptive business model characteristics based on Arthur et al.'s (1997: p.4-5). In this section I have modified the content so it relates specifically to complex adaptive business models (rather than the economy) but has retained the conceptual underpinning of each category provided by the original authors.

Section 1: Characteristics of a complex adaptive business model

Table 28: Expected characteristics of a complex adaptive business model [must be observable in a complex adaptive business model]

Expected characteristic	Description
Rules	The business model is governed by rules.
Boundaries	The business model operates within defined boundaries.
Agents	The business model empowers participants to make decisions.
Feedback	The business model exhibits both positive and negative feedback.
Adaptation	The business model changes continually.
Emergence	The business model changes in unplanned or unexpected ways.

Table 29: Further characteristics of a complex adaptive business model [expected by may not be observable]

General characteristic	Description
Open	The business model is an open system interacting in a series of larger systems (e.g. the economy).
Perceived value	The business model generates value which his perceived by its participants differently.
Growth paths and path dependency	The business model has multiple growth options that can close over time.
Disequilibrium	The business model constantly organises and reorganises.
Perpetual Novelty	The business model (and the firm) survive over time.

Section 2: Characteristics of a complex adaptive business model (expanded)

Expanded description of complex adaptive business model characteristics (based on Arthur et al., 1997 with significant modifications by author).

Initiation & rules

- Implementing a limited number of simple business rules will initiate a complex adaptive business model.
- Business rules must devolve maximum decision-making capacity from management to individuals inside and outside the firm on equal terms.
- The firm must make its resources (including staff) available to the complex adaptive business model with minimal restriction.
- The firm must not expect a complex adaptive business model to generate high financial returns (although it may).

Multiple constituent parts

- A complex adaptive business model is made up of many different parts; internal and external to the firm.
- No one part of a complex adaptive business model is more important than another.
- Removal or failure of a part of the complex adaptive business model will mean the business model automatically responds and adapts to the new circumstance without the need for management intervention.
- Competitors, agents, stakeholders, employees, suppliers, customers etc. are part of a complex adaptive business model and should be embraced by the firm.

Dispersed interaction

- Actions and reactions in a complex adaptive business model are determined by interaction between agents inside and outside the firm's boundaries.
- Agents are usually individuals but can be also be processes, computers, business units, etc.
- Agents make their own decisions (take their own actions) but are constrained by the business rules set by management and other applicable system rules (e.g. legal institutions, governments, assigned roles, cultural norms, etc.).
- A decision or action of a particular agent depends on:
    - The anticipation of actions of limited number of other agents (e.g. competitors; other customers), and;
    - The aggregated state of complex adaptive business model.

No single controller

- No single entity (e.g. the firm) can, or should try to, control interactions in a complex adaptive business model.
- Controls are provided by the mechanisms of competition and coordination between agents.
- There is no universal competitor - a single agent that can exploit all opportunities in the economy applicable to a complex adaptive business model.

Cross-cutting hierarchical organisation

- A complex adaptive business model will create many levels of informal organisation and interaction.
- Behaviours, actions, strategies, products, etc. at each level serve as 'building blocks' for constructing new and different units at the next higher level.
- The overall organisation is more than hierarchical, with many sorts of tangling interactions (associations, channels of communication) across levels.

Continual adaptation behaviours

- Actions, strategies, products, services, pricing, services, etc. are automatically revised as the individual agents accumulate experience.
- The outcome of the continual revision by the complex adaptive business model means that it constantly adapts.

Perpetual novelty

- A complex adaptive business model resides in a broader economic system.
- Niches in the economic system are continually exposed to the complex adaptive business model.
- Niches include new markets, new technologies, new behaviours, new institutions, new competitors etc.
- A complex adaptive business model can automatically take advantage of a niche; or ignore it – management cannot determine which will occur.
- The very act of filling (or ignoring) a niche may pressure the complex adaptive business model (or firm more broadly) in other areas.
- The result of taking advantage of niches and being pressured in other areas results in perpetual novelty.

Maintenance out of equilibrium

- A complex adaptive business model is able to maintain itself because new niches, new potentials, new possibilities, are continually created.
- Improvements are always possible and indeed occur regularly.
- A complex adaptive business model will not provide predictable returns or outcomes to the firm or its stakeholders; but will survive over time.

APPENDIX 4: In-depth interview questions for pilot interviews

INTRODUCTIONS Establish joint understanding of the business model.	**Interviewer:** ▪ Introduce self and introduce research. ▪ Ask interviewee introductory questions. ***Interview Questions:*** ▪ *Can you tell me a little about your background?* ▪ *Can you describe your role & responsibilities?* ▪ *This research involves business models, what do you think a business model is?* **Interviewer:** ▪ Explain that there are a lot of different types of business models. ▪ Show interviewee the representation of Southwest Airline's business model. ▪ Explain that the representation of Southwest Airlines business model is being provided to establish a joint understanding of a business model. ***Interview Questions:*** ▪ *Would you mind drawing the Cisco business model?* **Interviewer:** ▪ Explain to interviewee that the representation will be used to develop a consolidated version of the Cisco business model. ▪ Explain that the consolidated business model will be sent to the interviewee following the interview process. ▪ State that this is a voluntary activity. ▪ If the interviewee elects not to draw the Cisco business model show the representation developed from publically available information: ***Interview Questions:*** ▪ *Do you agree with this representation of Cisco's business model?'* ▪ *[if no]: What do you think is wrong with the representation?* **Interviewer:** ▪ Close off introductions and move to category questions. ▪ Use questions as a guide - not all questions are required – probe and follow up answers. ▪ Ask in no set order as the interview progresses.

RULES What rules and guidelines are identifiable in the business model?	▪ *Are there any organisational policies or guidelines you know of that are associated with the business model?* ▪ *Who manages the business model?* ▪ *Do you know of any rules that are associated with the business model?*
BOUNDARIES What boundaries are identifiable in the business model?	▪ *How is the business model controlled?* ▪ *What can't you change in the business model?* ▪ *Does the business model have any boundaries you know of?* ▪ *Are there any constraints to changing the business model that you know of?*
AGENTS How does the business model empower its participants to make decisions?	▪ *Who is involved with the business model?* ▪ *How are decisions made in the business model?* ▪ *Do you feel generally empowered in your role?* ▪ *Are you empowered to make decisions regarding the business model?*
FEEDBACK How does the business model exhibit feedback?	▪ *Where does information on the business model come from?* ▪ *Do you share information about the business model?* ▪ *What information do you think is the most important for the business model?* ▪ *How do you react to negative information about the business model?* ▪ *How do you react to non-standard requests from customers?*
ADAPTATION How does the business model achieve continuous change?	▪ *Do you change what you are doing in the business model often or occasionally?* ▪ *Do you make changes to the business model?* ▪ *Why do you make changes?* ▪ *Who approves the change?* ▪ *What about small changes?*
EMERGENCE How does the business model change in unplanned or unexpected ways?	▪ *How long has the organisation had the same business model?* ▪ *Has it changed much over that time?* ▪ *Do you think these changes were planned?* ▪ *Were there any major changes that you can describe?* ▪ *Did you expect these changes to occur or did they surprise you?*

APPENDIX 5: In-depth interview questions for executive and operational-level interviews

INTRODUCTIONS Establish joint understanding of the business model.	**Interviewer:** ▪ Introduce self and introduce research. ▪ Ask interviewee introductory questions. ***Interview Questions:*** ▪ *Can you tell me a little about your background?* ▪ *Can you describe your role & responsibilities?* ▪ *This research involves business models, what do you think a business model is?* **Interviewer:** ▪ Explain that there are a lot of different types of business models. ▪ Show interviewee the representation of Cisco's business model from pilot interviews. ▪ Explain that the representation of Cisco's business model is being provided to establish a joint understanding of a business model. ***Interview Questions:*** ▪ *Do you agree with this representation of Cisco's business model?'* ▪ *[if no]: What do you think is wrong with the representation?* **Interviewer:** ▪ Close off introductions and move to category questions. ▪ Use questions as a guide - not all questions are required – probe and follow up answers. ▪ Ask in no set order as the interview progresses.
RULES What rules and guidelines are identifiable in the business model?	▪ *Are there any organisational policies or guidelines you know of that are associated with the business model* ▪ *Who manages the business model?* ▪ *Do you know of any rules that are associated with the business model?*
BOUNDARIES What boundaries are identifiable in the business model?	▪ *How is the business model controlled?* ▪ *What can't you change in the business model?* ▪ *Does the business model have any boundaries you know of?* ▪ *Are there any constraints to changing the business model*

	that you know of?
AGENTS How does the business model empower its participants to make decisions?	▪ *Who is involved with the business model?* ▪ *How are decisions made in the business model?* ▪ *Do you feel generally empowered in your role?* ▪ *Are you empowered to make decisions regarding the business model?*
FEEDBACK How does the business model exhibit feedback?	▪ *Where does information on the business model come from?* ▪ *Do you share information about the business model?* ▪ *What information do you think is the most important for the business model?* ▪ *How do you react to negative information about the business model?* ▪ *How do you react to non-standard requests from customers?*
ADAPTATION How does the business model achieve continuous change?	▪ *Do you change what you are doing in the business model often or occasionally?* ▪ *Do you make changes to the business model?* ▪ *Why do you make changes?* ▪ *Who approves the change?* ▪ *What about small changes?*
EMERGENCE How does the business model change in unplanned or unexpected ways?	▪ *How long has the organisation had the same business model?* ▪ *Has it changed much over that time?* ▪ *Do you think these changes were planned?* ▪ *Were there any major changes that you can describe?* ▪ *Did you expect these changes to occur or did they surprise you?*

APPENDIX 6: Interview coding schema and number of coded references

Code	Number of sources	Number of Coding References	Number of Words Coded	Number of Paragraphs Coded
Nodes\\Approval in business model	14	36	1,179	41
Nodes\\BAU in business model	2	2	27	2
Nodes\\CAS - living organism	21	73	2,730	79
Nodes\\CAS - Adaptation in business model	26	137	4,844	148
Nodes\\CAS - agents	25	111	3,839	117
Nodes\\CAS - boundaries	22	76	2,921	82
Nodes\\CAS - change in behaviour	16	36	1,286	37
Nodes\\CAS - evolution in business model	21	74	2,537	77
Nodes\\CAS - feedback	24	101	3,607	111
Nodes\\CAS - new niches	7	10	265	11
Nodes\\CAS - organic	9	15	580	15
Nodes\\CAS - path dependency	8	13	543	15
Nodes\\CAS - Rules	11	27	808	27
Nodes\\Change - decision to	12	25	960	28
Nodes\\Change - external environment	22	72	2,199	81
Nodes\\Change - iterative or incremental in business model	18	40	1,622	47
Nodes\\Change - major in business model	22	56	2,046	66
Nodes\\Change - motivation in business model	26	118	4,302	127
Nodes\\Change - planned in business model	20	44	1,409	47
Nodes\\Change - proactive in business model	13	21	915	26
Nodes\\Change - rate in business model	22	74	2,377	80
Nodes\\Change - reaction in business model	9	16	584	20
Nodes\\Change - reaction to change in business model	21	40	1,358	47
Nodes\\Change - reactive in business model	21	52	1,829	62
Nodes\\Change - resistance to	20	60	2,246	63
Nodes\\Change - static in business model	4	5	162	6
Nodes\\Change - surprised in business model	17	25	509	25
Nodes\\Change - time to	15	37	1,330	42
Nodes\\Change - in business model	6	19	642	23
Nodes\\Cisco - external view of	10	13	255	13
Nodes\\Cisco - externally worked with	12	16	336	17
Nodes\\Cisco - new business model	4	4	121	4
Nodes\\collaboration	14	39	1,596	42
Nodes\\Communication - formal in business model	20	53	1,667	56
Nodes\\Communication - informal in business model	24	69	2,286	81
Nodes\\Communication in business model	12	22	618	24
Nodes\\Competitors in business model	24	65	1,915	70
Nodes\\Components of business model	7	12	335	13
Nodes\\Control in business model	18	27	781	27
Nodes\\Culture in the business model	19	60	1,986	65
Nodes\\Customers - importance of in business model	22	68	2,461	71
Nodes\\Customer success	12	31	1,222	31
Nodes\\Customers in business model	23	60	2,151	63
Nodes\\Decision making	17	48	1,762	51
Nodes\\Definition of Business Model	5	13	258	13
Nodes\\Deliverables of business model	8	16	442	16
Nodes\\Empowerment - decision making	22	52	1,804	57
Nodes\\Empowerment - personal	25	103	3,208	111
Nodes\\Engagement with external environment	20	56	1,898	62
Nodes\\Flexibility	17	45	1,613	48
Nodes\\Flexibility - Inflexible	11	19	816	21
Nodes\\Influence	7	16	470	16
Nodes\\informal	11	17	688	19
Nodes\\Informal interactions in business model	14	32	1,125	34
Nodes\\Information - external in business model	9	12	406	15
Nodes\\Information - finding	20	47	1,477	53
Nodes\\Information - internal in business model	17	22	683	23
Nodes\\Information - most important in business model	23	37	988	37
Nodes\\Information - negative	24	40	1,288	40
Nodes\\Information - sharing in business model	22	58	1,745	60
Nodes\\Information in business model	8	20	695	21
Nodes\\Intercloud as new business model	27	73	2,436	77
Nodes\\Key Quote	27	208	7,589	230

Nodes\\leadership	12	28	1,035	29
Nodes\\learning in business model	11	20	624	24
Nodes\\Levels in business models	3	3	72	3
Nodes\\Management of business model	26	73	2,362	75
Nodes\\Missing component in business model	14	32	866	32
Nodes\\Multiple Business Models	1	2	25	2
Nodes\\Neoclassical paradigm in business model	2	3	108	3
Nodes\\Non-standard requests - rate of change	6	7	220	7
Nodes\\Non-standard requests as change in business model	20	34	1,066	35
Nodes\\Non-standard requests in business model	25	41	1,119	41
Nodes\\Organisational memory	8	10	243	10
Nodes\\Organisational Structure	23	70	2,433	73
Nodes\\Participants - external	21	48	1,362	49
Nodes\\Participants involved with business model	26	111	2,929	115
Nodes\\Partners in business model	20	38	1,032	40
Nodes\\Philosophy of Business Model	15	24	690	26
Nodes\\Policies in business model	26	64	1,746	71
Nodes\\Politics	8	13	372	13
Nodes\\Preference for representation of business model	5	11	190	11
Nodes\\Problems or limitations with business model	19	62	2,231	63
Nodes\\Process view of Business Model	9	17	755	18
Nodes\\Relationships in business model	14	29	979	30
Nodes\\Representation of Cisco Product Business Model	16	21	475	21
Nodes\\Representation of Cisco Services Business Model	12	23	663	23
Nodes\\Routing & Switching Business Model	20	38	989	42
Nodes\\Services business model	14	42	1,448	42
Nodes\\Strategy in business model	23	75	2,927	80
Nodes\\Trust in business model	7	16	376	17
Nodes\\Value in business model	12	22	693	22

APPENDIX 7: Additional data for 'rules'

Data contained in this appendix:

FOLLOWS RULES	Participant identifies following rules Rules category includes policies, guidelines, rules.
BY BUS MODEL	Participant identifies following rules by business model Number of mentions of rules by business model
BY LEVEL	Participant identifies following rules by level of business Number of mentions of rules by level of business
BY AREA	Participant identifies following rules by business area Number of mentions of rules by business area
IDENTIFY TYPE	Policy areas identified by participants Policies identified by participants by business model Policies areas identified by participants by business model Policies identified by participants by name
RULES ARE	Rules followed by participants
BREAKING RULES	Participant identifies breaking rules Breaking rules category includes breaking rules, pushing envelope, making exceptions,
BY BUS MODEL	Participant identifies breaking rules by business model
BY LEVEL	Participant identifies breaking rules by level in business
BY AREA	Participant identifies breaking rules by business area

Participant identifies following rules
Rules category includes policies, guidelines, rules.

	Identifies following rules	Number of mentions
Oliver	No	0
Olly	Yes	16
Ophelia	Yes	2
Ocean	Yes	4
Edward	Yes	3
Odin	Yes	4
Olga	Yes	7
Oli	Yes	1
Omar	No	0
Emmanuelle	Yes	7
Oran	Yes	1
Olympia	Yes	8
Omari	Yes	4
Orchid	Yes	3
Edwina	Yes	1
Orlando	Yes	3
Orson	Yes	5
Ozzy	Yes	1
Elfie	Yes	5
Oswald	No	0
Otto	Yes	2
Eva	Yes	2
Olaf	Yes	2
Odysseus	Yes	4
Onofredo	Yes	1
Orpheus	Yes	4
Osiris	Yes	2
Total	24	92
Percentage	89%	

Participant identifies following rules by business model

	Name: Product Business Model = Yes	Name: Services Business Model = Yes	Total Sources
1 : CAS - rules (discusses or mentions)	12	12	24
2 : Identifies rule by name	12	12	24
3 : Identifies rules do not exist	2	1	3

Number of mentions of rules by business model

	Name: Product Business Model = Yes	Name: Services Business Model = Yes	Total Sources
1 : CAS - rules (discusses or mentions)	40	52	92
2 : Identifies rule by name	13	12	25
3 : Identifies rules do not exist	2	1	3

Participant identifies following rules by level of business

	Name: Level in Business = Junior	Name: Level in Business = Middle	Name: Level in Business = Executive	Total Sources
1 : CAS - rules (discusses or mentions)	13	7	4	24
2 : Identifies rule by name	13	7	4	24
3 : Identifies rules do not exist	2	0	1	3

Number of mentions of rules by level of business

	Name: Level in Business = Junior	Name: Level in Business = Middle	Name:Level in Business = Executive	Total Sources
1 : CAS - rules (discusses or mentions)	60	17	15	92
2 : Identifies rule by name	14	7	4	25
3 : Identifies rules do not exist	2	0	1	3

Participant identifies following rules by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total Sources
1 : CAS - rules (discusses or mentions)	10	6	8	24
2 : Identifies rule by name	10	6	8	24
3 : Identifies rules do not exist	0	2	1	3

Number of mentions of rules by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total Sources
1 : CAS - rules (discusses or mentions)	36	31	25	92
2 : Identifies rule by name	11	6	8	25
3 : Identifies rules do not exist	0	2	1	3

Policy areas identified by participants

	Total Sources
1 : Policies Legal & Finance Identified	12
2 : Policies - COBC or Ethics Identified	11
3 : HR policies Identified	9
4 : Policies - Others Identified	6

Policies areas identified by participants by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total Sources
1 : Policies Legal & Finance	5	7	12
2 : Policies - COBC* or Ethics	7	4	11
3 : HR policies	5	1	6
4 : Policies - Others	5	4	9

* COBC = Code of Business Conduct

Policies identified by participants by name

List of policies Identified by name	Financial & Legal	Ethical	HR	Other
	Bookings policy	Code of business conduct	Human resources policies	Travel and expense policies
	Non standard deal policy	Risky business policy	Hiring policy	Compliance policies (e.g. electrical)
	Laws & regulations			Manufacturing policies
	Shareholding policies			Partner programs
				Occupational safety & health policies

Rules parsed from participants

What are the rules?	
	Make good choices
	Follow the law
	Do the right thing by the customer
	Act ethically
	Make it profitable

Participant identifies breaking rules

	Identifies breaking rules	Number of mentions
Oliver	Yes	1
Olly	Yes	2
Ophelia	Yes	2
Ocean	Yes	2
Edward	Yes	1
Odin	Yes	2
Olga	Yes	1
Oli	Yes	1
Omar	No	0
Emmanuelle	Yes	2
Oran	No	0
Olympia	Yes	1
Omari	Yes	1
Orchid	Yes	1
Edwina	Yes	1
Orlando	No	0
Orson	No	0
Ozzy	Yes	1
Elfie	Yes	2
Oswald	Yes	2
Otto	Yes	2
Eva	No	0
Olaf	No	0
Odysseus	Yes	2
Onofredo	No	0
Orpheus	No	0
Osiris	No	0
Total	18	27
Percentage	67%	

Participant identifies breaking rules by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total Sources
1 : Rules - breaking or pushing	8	10	18

Participant identifies breaking rules by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total Sources
1 : Rules - breaking or pushing	10	5	3	18

Participant identifies breaking rules by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total Sources
1 : Rules - breaking or pushing	5	6	7	18

Participant identifies following rules. Participant identifies breaking rules.

	Identifies following rules	Identifies breaking rules
Oliver	No	Yes
Olly	Yes	Yes
Ophelia	Yes	Yes
Ocean	Yes	Yes
Edward	Yes	Yes
Odin	Yes	Yes
Olga	Yes	Yes
Oli	Yes	Yes
Omar	No	No
Emmanuelle	Yes	Yes
Oran	Yes	No
Olympia	Yes	Yes
Omari	Yes	Yes
Orchid	Yes	Yes
Edwina	Yes	Yes
Orlando	Yes	No
Orson	Yes	No
Ozzy	Yes	Yes
Elfie	Yes	Yes
Oswald	No	Yes
Otto	Yes	Yes
Eva	Yes	No
Olaf	Yes	No
Odysseus	Yes	Yes
Onofredo	Yes	No
Orpheus	Yes	No
Osiris	Yes	No
Total	24	18

Participant follows and/or breaks rules matrix summary

	Follows but does not break rules	Follows and breaks rules	Does not follow and breaks rules
Oliver			yes
Olly		Yes	
Ophelia		Yes	
Ocean		Yes	
Edward		Yes	
Odin		Yes	
Olga		Yes	
Oli		Yes	
Omar	removed	removed	removed
Emmanuelle		Yes	
Oran	Yes		
Olympia		Yes	
Omari		Yes	
Orchid		Yes	
Edwina		Yes	
Orlando	Yes		
Orson	Yes		
Ozzy		Yes	
Elfie		Yes	
Oswald		Yes	
Otto		Yes	
Eva	Yes		
Olaf	Yes		
Odysseus		Yes	
Onofredo	Yes		
Orpheus	Yes		
Osiris	Yes		
Total Participants	*7*	*17*	*1*
Percentage	*28%*	*68%*	*4%*

APPENDIX 8: Additional data for 'boundaries'

Data contained in this appendix:

IDENTIFIES BOUNDARIES	Participant identifies boundaries Boundary category includes envelopes, limits, frameworks, lines, guidelines
BY BUS MODEL	Participant identifies boundaries by business model Number of mentions of boundaries by business model
BY LEVEL	Participant identifies boundaries by level in business Number of mentions of boundaries by level in business
BY AREA	Participant identifies boundaries by business area Number of mentions of boundaries by business area
IDENTIFY TYPE	Boundaries identified by participants

Participant identifies boundaries
Boundary category includes envelopes, limits, frameworks, lines, guidelines

	Identifies boundaries	Number of mentions
Oliver	No	0
Olly	Yes	8
Ophelia	Yes	4
Ocean	Yes	6
Edward	No	0
Odin	Yes	3
Olga	Yes	5
Oli	Yes	5
Omar	No	0
Emmanuelle	No	0
Oran	No	1
Olympia	No	4
Omari	No	0
Orchid	No	0
Edwina	No	0
Orlando	Yes	3
Orson	Yes	2
Ozzy	Yes	2
Elfie	No	0
Oswald	Yes	3
Otto	No	0
Eva	Yes	3
Olaf	Yes	1
Odysseus	Yes	2
Onofredo	No	0
Orpheus	No	0
Osiris	No	0
Total	16	52
Percentage	59%	

Participant identifies boundaries by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total
1 : CAS - boundaries (discusses or mentions)	8	8	16
2 : Identifies boundary by name	6	6	12
3 : Identifies boundaries do not exist	0	1	1

Note: some participants identify boundaries but do not name them. Some name multiple.

Number of mentions of boundaries by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total References
1 : CAS - boundaries (discusses or mentions)	22	30	52
2 : Identifies boundary by name	14	11	25
3 : Identifies boundaries do not exist	0	3	3

Note: some participants identify boundaries but do not name them. Some name multiple.

Participant identifies boundaries by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : CAS - boundaries (discusses or mentions)	9	4	3	16
2 : Identifies boundary by name	7	4	1	12
3 : Identifies boundaries do not exist	0	1	0	1

Note: some participants identify boundaries but do not name them. Some name multiple.

Number of mentions of boundaries by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : CAS - boundaries (discusses or mentions)	29	15	8	52
2 : Identifies boundary by name	16	6	3	25
3 : Identifies boundaries do not exist	0	3	0	3

Note: some participants identify boundaries but do not name them. Some name multiple.

Participant identifies boundaries by area of business

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total References
1 : CAS - boundaries (discusses or mentions)	5	5	6	16
2 : Identifies boundary by name	3	4	5	12
3 : Identifies boundaries do not exist	0	1	0	1

Note: some participants identify boundaries but do not name them. Some name multiple.

Number of mentions of boundaries by area of business

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total References
1 : CAS - boundaries (discusses or mentions)	10	18	24	52
2 : Identifies boundary by name	6	12	7	25
3 : Identifies boundaries do not exist	0	3	0	3

Note: some participants identify boundaries but do not name them. Some name multiple.

Boundaries identified by participants

List of boundaries Identified by name	Financial & Legal	Organisational	Customer/external
	Profitability	**Sales commissions**	Customer forecasts
	Government policy	Senior management/management	Customer RFP specifications
	Laws	**Internal Inertia**	Contractual terms
	Regulations	**Products & Services available to sell**	Customer budgets
	Internal funding/Opex	Back end business processes	
	Financial year limits	Organisational structure	
	Shareholder returns		

Bold=Mentioned by at least 3 interviewees

APPENDIX 9: Additional data for 'agents'

Data contained in this appendix:

IDENTIFIES EMPOWERMENT	Participant identifies personal decision empowerment
BY BUS MODEL	Participant identifies personal decision empowerment by business model Number of mentions of personal decision empowerment by business model
BY LEVEL	Participant identifies personal decision empowerment by level in business Number of mentions of personal decision empowerment by level in business
BY AREA	Participant identifies personal decision empowerment by business area Number of mentions of personal decision empowerment by business area
IDENTIFY TYPE	List of decision types participants identify as within personal decision empowerment
IDENTIFIES COLLABORATION	Participant identifies importance of collaboration in decision making process Category includes collaboration, consensus, agreement
BY BUS MODEL	Participant identifies importance of collaboration in decision process by business model
BY LEVEL	Participant identifies importance of collaboration in decision process by level in business
BY AREA	Participant identifies importance of collaboration in decision process by business area

Participant identifies personal decision empowerment

	Identifies decision empowerment	Number of mentions
Oliver	Yes	6
Olly	Yes	2
Ophelia	Yes	8
Ocean	Yes	7
Edward	Yes	9
Odin	Yes	5
Olga	Yes	3
Oli	No	0
Omar	Yes	2
Emmanuelle	No	0
Oran	Yes	2
Olympia	Yes	5
Omari	Yes	8
Orchid	Yes	3
Edwina	Yes	3
Orlando	Yes	2
Orson	Yes	3
Ozzy	Yes	4
Elfie	Yes	1
Oswald	Yes	2
Otto	Yes	3
Eva	Yes	1
Olaf	Yes	3
Odysseus	Yes	4
Onofredo	No	0
Orpheus	Yes	3
Osiris	Yes	7
Total	24	96
Percentage	89%	

Participant identifies personal decision empowerment by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total References
1 : Empowerment (discusses or mentions)	13	11	24
2 : Identifies personal decision empowerment	9	11	20
3 : Identifies limited or restricted personal decision empowerment	4	3	7

Number of mentions of personal decision empowerment by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total References
1 : Empowerment (discusses or mentions)	47	49	96
2 : Identifies personal decision empowerment	19	26	45
3 : Identifies limited or restricted personal decision empowerment	4	3	7

Participant identifies personal decision empowerment by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : Empowerment (discusses or mentions)	15	6	3	24
2 : Identifies personal decision empowerment	11	6	3	20
3 : Identifies limited or restricted personal decision empowerment	3	1	3	7

Number of mentions of personal decision empowerment by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : Empowerment (discusses or mentions)	53	39	4	96
2 : Identifies personal decision empowerment	26	16	3	45
3 : Identifies limited or restricted personal decision empowerment	3	1	3	7

Participant identifies personal decision empowerment by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total References
1 : Empowerment (discusses or mentions)	8	8	8	24
2 : Identifies personal decision empowerment	7	6	7	20
3 : Identifies limited or restricted personal decision empowerment	3	3	1	7

Number of mentions of personal decision empowerment by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total References
1 : Empowerment (discusses or mentions)	27	30	39	96
2 : Identifies personal decision empowerment	17	9	19	45
3 : Identifies limited or restricted personal decision empowerment	3	3	1	7

List of decision types participants identify as within personal decision empowerment

Decision areas	Financial & Legal	Organisational	Customer
	Discounting	Resource allocations	RFP responses
	Pricing	Hiring & firing	Sales approach
	Special terms	Personal kip's	Delivery & operational choices
	Service Level Agreements	Personal projects/initiatives	

Participant identifies importance of collaboration in decision making process

Category includes collaboration, consensus, agreement

	Identifies importance of collaboration	Number of mentions
Oliver	No	0
Olly	Yes	1
Ophelia	Yes	3
Ocean	Yes	2
Edward	No	0
Odin	No	0
Olga	Yes	2
Oli	Yes	1
Omar	No	0
Emmanuelle	No	0
Oran	No	0
Olympia	Yes	3
Omari	Yes	7
Orchid	Yes	1
Edwina	Yes	3
Orlando	Yes	4
Orson	Yes	4
Ozzy	Yes	1
Elfie	No	0
Oswald	No	0
Otto	Yes	2
Eva	No	0
Olaf	Yes	3
Odysseus	Yes	4
Onofredo	No	0
Orpheus	Yes	3
Osiris	No	0
Total	16	44
Percentage	59%	

Participant identifies importance of collaboration in decision process by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total References
1 : Collaboration (discusses or mentions)	7	9	16

Participant identifies importance of collaboration in decision process by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : Collaboration (discusses or mentions)	11	4	1	16

Participant identifies importance of collaboration in decision process by business area

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : Collaboration (discusses or mentions)	11	4	1	16

Participant identifies personal decision empowerment.
Participant identifies importance of collaboration in decision making process.

	Identifies decision empowerment	Identifies importance of collaboration
Oliver	Yes	No
Olly	Yes	Yes
Ophelia	Yes	Yes
Ocean	Yes	Yes
Edward	Yes	No
Odin	Yes	No
Olga	Yes	Yes
Oli	No	Yes
Omar	Yes	No
Emmanuelle	No	No
Oran	Yes	No
Olympia	Yes	Yes
Omari	Yes	Yes
Orchid	Yes	Yes
Edwina	Yes	Yes
Orlando	Yes	Yes
Orson	Yes	Yes
Ozzy	Yes	Yes
Elfie	Yes	No
Oswald	Yes	No
Otto	Yes	Yes
Eva	Yes	No
Olaf	Yes	Yes
Odysseus	Yes	Yes
Onofredo	No	No
Orpheus	Yes	Yes
Osiris	Yes	No
Total	24	16

Participant has personal decision empowerment and/or collaborates in making decisions matrix summary

	Mentions importance of decision empowerment, but does not mention need to collaborate in order to make decisions	Mentions importance of decision empowerment, and mentions need to collaborate in order to make decisions
Oliver	Yes	
Olly		Yes
Ophelia		Yes
Ocean		Yes
Edward		Yes
Odin	Yes	
Olga	Yes	
Oli		Yes
Omar	N/A	N/A
Emmanuelle	Yes	
Oran	N/A	N/A
Olympia	Yes	
Omari		Yes
Orchid		Yes
Edwina		Yes
Orlando		Yes
Orson		Yes
Ozzy		Yes
Elfie		Yes
Oswald	Yes	
Otto	Yes	
Eva		Yes
Olaf	Yes	
Odysseus		Yes
Onofredo		Yes
Orpheus	N/A	N/A
Osiris		Yes
Oliver	Yes	
Total	9	15

APPENDIX 10: Additional data for 'feedback'

Data contained in this appendix:

IDENTIFIES FEEDBACK	Participant identifies feedback loop(s) in business model Participant identifies type of feedback loop(s) in business model Negative feedback category includes: reporting, assessment, deviations, metrics, numbers, control Positive feedback category includes: Lock-in, binding, extending, success, advantage, competitive advantage, competition, standards, amplification, increases, exponential, compounding
BY BUS MODEL	Participant identifies feedback loop(s) by business model Number of mentions of personal decision empowerment by business model
BY LEVEL	Participant identifies feedback loop(s) by level in business Number of mentions of feedback loop(s) by level in business
BY AREA	Participant identifies feedback loop(s) by business area Number of mentions of feedback loop(s) by business area

Participant identifies feedback loop(s) in business model

	Identifies feedback loops in business model	Number of mentions
Oliver	Yes	3
Olly	Yes	4
Ophelia	Yes	6
Ocean	Yes	3
Edward	Yes	2
Odin	Yes	2
Olga	Yes	9
Oli	Yes	2
Omar	Yes	3
Emmanuelle	Yes	3
Oran	Yes	1
Olympia	Yes	5
Omari	Yes	6
Orchid	Yes	1
Edwina	Yes	4
Orlando	Yes	1
Orson	Yes	5
Ozzy	Yes	8
Elfie	Yes	1
Oswald	Yes	1
Otto	Yes	5
Eva	Yes	3
Olaf	Yes	6
Odysseus	Yes	3
Onofredo	No	0
Orpheus	Yes	6
Osiris	Yes	4
Total	26	97
Percentage	96%	

Participant identifies type of feedback loop(s) in business model

Negative feedback category includes: reporting, assessment, deviations, metrics, numbers, control
Positive feedback category includes: Lock-in, binding, extending, success, advantage, competitive advantage, competition, standards, amplification, increases, exponential, compounding

	Identifies negative feedback loop(s) in business model	Number of mentions	Identifies positive feedback loop(s) in business model	Number of mentions
Oliver	Yes	1	Yes	3
Olly	Yes	2	Yes	2
Ophelia	Yes	4	Yes	2
Ocean	Yes	3	No	0
Edward	Yes	1	Yes	1
Odin	Yes	2	No	0
Olga	Yes	8	Yes	1
Oli	Yes	1	Yes	1
Omar	Yes	1	Yes	2
Emmanuelle	Yes	2	Yes	1
Oran	Yes	1	No	0
Olympia	Yes	1	Yes	4
Omari	Yes	4	Yes	2
Orchid	No	0	Yes	1
Edwina	No	0	Yes	3
Orlando	Yes	1	No	0
Orson	Yes	5	Yes	1
Ozzy	Yes	5	Yes	3
Elfie	No	0	Yes	1
Oswald	Yes	1	No	0
Otto	Yes	4	Yes	1
Eva	Yes	4	Yes	1
Olaf	Yes	3	Yes	3
Odysseus	Yes	1	Yes	3
Onofredo	No	0	No	0
Orpheus	Yes	4	No	0
Osiris	No	0	Yes	3
Total	22	59	20	39
Percentage	81%		74%	

Participant identifies feedback loop(s) by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total
1 : CAS - feedback (discusses or mentions)	13	13	26
2 : CAS - Identifies negative feedback	10	12	22
3 : CAS - Identifies positive feedback	10	10	20

Number of mentions of feedback loop(s) by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total References
1 : CAS - feedback (discusses or mentions)	41	56	97
2 : CAS - Identifies negative feedback	24	35	59
3 : CAS - Identifies positive feedback	21	18	39

Participant identifies feedback loop(s) by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total
1 : CAS - feedback (discusses or mentions)	15	6	5	26
2 : CAS - Identifies negative feedback	13	5	4	22
3 : CAS - Identifies positive feedback	11	4	5	20

Number of mentions of feedback loop(s) by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : CAS - feedback (discusses or mentions)	56	29	12	97
2 : CAS - Identifies negative feedback	33	18	8	59
3 : CAS - Identifies positive feedback	23	10	6	39

Participant identifies feedback loop(s) by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total
1 : CAS - feedback (discusses or mentions)	9	8	9	26
2 : CAS - Identifies negative feedback	6	8	8	22
3 : CAS - Identifies positive feedback	8	6	6	20

Number of mentions of feedback loop(s) by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total References
1 : CAS - feedback (discusses or mentions)	31	34	32	97
2 : CAS - Identifies negative feedback	16	22	21	59
3 : CAS - Identifies positive feedback	15	14	10	39

APPENDIX 11: Additional data for 'adaptation'

Data contained in this appendix:

IDENTIFIES ADAPTATION	Participant identifies adaptation of business model Adaptation category includes identification of constant change through adaptations, adjustments, small changes, enhancements, etc.
BY BUS MODEL	Participant identifies adaptation by business model Number of mentions of adaptation by business model
BY LEVEL	Participant identifies adaptation by level in business Number of mentions of adaptation by level in business
BY AREA	Participant identifies adaptation by business area Number of mentions of adaptation by business area

Participant identifies adaptation of business model
Adaptation category includes identification of constant change through adaptations, adjustments, small changes, enhancements, etc.

	Identifies adaptation	Number of mentions
Oliver	Yes	3
Olly	Yes	9
Ophelia	Yes	8
Ocean	No	0
Edward	Yes	5
Odin	Yes	1
Olga	Yes	11
Oli	Yes	8
Omar	Yes	1
Emmanuelle	Yes	3
Oran	Yes	1
Olympia	Yes	1
Omari	Yes	5
Orchid	Yes	2
Edwina	Yes	7
Orlando	Yes	3
Orson	Yes	2
Ozzy	Yes	4
Elfie	Yes	1
Oswald	Yes	4
Otto	Yes	4
Eva	Yes	2
Olaf	Yes	4
Odysseus	Yes	2
Onofredo	Yes	1
Orpheus	Yes	6
Osiris	Yes	2
Total	26	99
Percentage	96%	

Participant identifies adaptation by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total References
1 : CAS - adaptation (discusses or mentions)	13	13	26
2 : Identifies constant change in business model	11	11	22
3 : Identifies limited or restricted change in business model	4	2	6

Number of mentions of adaptation by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total References
1 : CAS - adaptation (discusses or mentions)	29	70	99
2 : Identifies constant change in business model	26	28	54
3 : Identifies limited or restricted change in business model	4	4	8

Participant identifies adaptation by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : CAS - adaptation (discusses or mentions)	15	6	5	26
2 : Identifies constant change in business model	13	6	3	22
3 : Identifies limited or restricted change in business model	3	3	0	6

Number of mentions of adaptation by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : CAS - adaptation (discusses or mentions)	64	20	15	99
2 : Identifies constant change in business model	33	14	7	54
3 : Identifies limited or restricted change in business model	3	5	0	8

Participant identifies adaptation by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total References
1 : CAS - adaptation (discusses or mentions)	10	8	8	26
2 : Identifies constant change in business model	8	6	8	22
3 : Identifies limited or restricted change in business model	3	1	2	6

Number of mentions of adaptation by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total References
1 : CAS - adaptation (discusses or mentions)	21	34	44	99
2 : Identifies constant change in business model	17	15	22	54
3 : Identifies limited or restricted change in business model	3	1	4	8

APPENDIX 12: Additional data for 'emergence'

Data contained in this appendix:

IDENTIFIES EMERGENCE	Participant identifies emergence of business model Emergence category includes unplanned changes in business model and surprise at changes in business model
BY BUS MODEL	Participant identifies emergence by business model Number of mentions of emergence by business model
BY LEVEL	Participant identifies emergence by level in business Number of mentions of emergence by level in business
BY AREA	Participant identifies emergence by business area Number of mentions of emergence by business area
IDENTIFIES PLANNING	Participant identifies planning or not planning in business model
IDENTIFIES SURPRISE	Participant identifies surprise at change in business model

Emergence category includes unplanned changes in business model and surprise at changes in business model

	Identifies emergence	Number of mentions
Oliver	Yes	1
Olly	No	0
Ophelia	Yes	5
Ocean	Yes	1
Edward	Yes	1
Odin	No	0
Olga	Yes	3
Oli	Yes	3
Omar	Yes	5
Emmanuelle	Yes	3
Oran	Yes	1
Olympia	Yes	8
Omari	Yes	3
Orchid	Yes	2
Edwina	Yes	13
Orlando	No	0
Orson	Yes	1
Ozzy	No	0
Elfie	Yes	1
Oswald	Yes	5
Otto	Yes	2
Eva	Yes	1
Olaf	Yes	3
Odysseus	No	0
Onofredo	No	0
Orpheus	Yes	4
Osiris	Yes	10
Total	21	76
Percentage	78%	

Participant identifies emergence by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total References
1 : CAS - emergence (discusses or mentions)	12	9	21
2 : Identifies emergence	9	7	16
3 : Identifies limited or restricted emergence	2	4	6

Number of mentions of emergence by business model

	Name:Product Business Model = Yes	Name:Services Business Model = Yes	Total References
1 : CAS - emergence (discusses or mentions)	36	40	76
2 : Identifies emergence	24	20	44
3 : Identifies limited or restricted emergence	3	4	7

Participant identifies emergence by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : CAS - emergence (discusses or mentions)	12	4	5	21
2 : Identifies emergence	9	3	4	16
3 : Identifies limited or restricted emergence	1	3	2	6

Number of mentions of emergence by level in business

	Name:Level in Business = Junior	Name:Level in Business = Middle	Name:Level in Business = Executive	Total References
1 : CAS - emergence (discusses or mentions)	44	19	13	76
2 : Identifies emergence	28	11	5	44
3 : Identifies limited or restricted emergence	1	4	2	7

Participant identifies emergence by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total References
1 : CAS - emergence (discusses or mentions)	9	5	7	21
2 : Identifies emergence	7	5	4	16
3 : Identifies limited or restricted emergence	2	0	4	6

Number of mentions of emergence by business area

	Name:Business Area = Sales	Name:Business Area = Support Function	Name:Business Area = Services	Total References
1 : CAS - emergence (discusses or mentions)	31	14	31	76
2 : Identifies emergence	21	12	11	44
3 : Identifies limited or restricted emergence	3	0	4	7

Participant identifies planning or not planning in business model

	Identifies planning	Number of mentions	Identifies not planning	Number of mentions
Oliver	No	0	No	0
Olly	Yes	2	No	0
Ophelia	No	0	Yes	2
Ocean	Yes	1	Yes	2
Edward	No	0	Yes	1
Odin	No	0	Yes	1
Olga	Yes	1	Yes	2
Oli	No	0	Yes	1
Omar	No	0	Yes	1
Emmanuelle	Yes	1	Yes	1
Oran	No	0	No	0
Olympia	Yes	1	Yes	3
Omari	No	0	Yes	1
Orchid	No	0	Yes	1
Edwina	No	0	Yes	2
Orlando	No	0	Yes	4
Orson	No	0	Yes	1
Ozzy	Yes	2	No	0
Elfie	No	0	No	0
Oswald	No	0	Yes	4
Otto	No	0	No	0
Eva	No	0	Yes	2
Olaf	Yes	2	Yes	1
Odysseus	No	0	Yes	1
Onofredo	Yes	1	Yes	1
Orpheus	Yes	3	No	0
Osiris	No	0	Yes	1
Total	9	14	20	33
Percentage	33%		74%	

Removed overlaps		
6 Overlaps & 4 non responses	10	
Remaining responses	17	
Participants identifying limited or no planning	14	82%
Participants identifying planning	3	18%

Participant identifies surprise at change in business model

	Identifies surprise	Number of mentions
Oliver	No	0
Olly	Yes	1
Ophelia	Yes	2
Ocean	Yes	1
Edward	No	0
Odin	No	0
Olga	Yes	3
Oli	No	0
Omar	No	0
Emmanuelle	No	0
Oran	No	0
Olympia	No	0
Omari	Yes	1
Orchid	No	0
Edwina	Yes	1
Orlando	No	0
Orson	Yes	1
Ozzy	No	0
Elfie	No	0
Oswald	Yes	1
Otto	No	0
Eva	No	0
Olaf	Yes	1
Odysseus	Yes	1
Onofredo	No	0
Orpheus	Yes	1
Osiris	Yes	1
Total	12	15
Percentage	44%	

Participant identifies planning, not planning, surprise at change in business model matrix summary	Surprised		Planned		Not Planned	
	Mentioned	Number of mentions	Mentioned Planned	Number of mentions	Mentioned NOT Planned	Number of mentions
Oliver	No	0	No	0	No	0
Olly	Yes	1	Yes	2	No	0
Ophelia	Yes	2	No	0	Yes	2
Ocean	Yes	1	Yes	1	Yes	2
Edward	No	0	No	0	Yes	1
Odin	No	0	No	0	Yes	1
Olga	Yes	3	Yes	1	Yes	2
Oli	No	0	No	0	Yes	1
Omar	No	0	No	0	Yes	1
Emmanuelle	No	0	Yes	1	Yes	1
Oran	No	0	No	0	No	0
Olympia	No	0	Yes	1	Yes	3
Omari	Yes	1	No	0	Yes	1
Orchid	No	0	No	0	Yes	1
Edwina	Yes	1	No	0	Yes	2
Orlando	No	0	No	0	Yes	4
Orson	Yes	1	No	0	Yes	1
Ozzy	No	0	Yes	2	No	0
Elfie	No	0	No	0	No	0
Oswald	Yes	1	No	0	Yes	4
Otto	No	0	No	0	No	0
Eva	No	0	No	0	Yes	2
Olaf	Yes	1	Yes	2	Yes	1
Odysseus	Yes	1	No	0	Yes	1
Onofredo	No	0	Yes	1	Yes	1
Orpheus	Yes	1	Yes	3	No	0
Osiris	Yes	1	No	0	Yes	1
Total	12	15	9	14	20	33

APPENDIX 13: Time, date, and duration of interviews

Participant	Date of interview	Time of interview	Duration of interview (in minutes)
Eva	18/11/2014	1.00pm	42
Oran	18/11/2014	9.30am	48
Orlando	17/11/2014	2.30pm	80
Orson	10/12/2014	2.30pm	36
Olaf	20/11/2014	9.30am	51
Onofredo	10/10/2014	2.00pm	60
Orpheus	24/11/2014	9.30am	49
Osiris	20/11/2014	12.00am	53
Edward	18/12/2014	3.30pm	44
Emmanuelle	21/11/2014	10.00am	31
Edwina	21/11/2014	2.30pm	64
Elfie	25/11/2014	5.30pm	61
Olly	24/11/2014	12.00am	70
Ophelia	20/11/2014	4.30pm	62
Ocean	25/11/2014	9.30am	50
Odin	10/10/2014	10.00am	47
Olga	4/12/2014	2.00pm	78
Oli	19/11/2014	2.00pm	61
Olympia	19/11/2014	10.30am	54
Omari	8/12/2014	3.00pm	64
Orchid	25/11/2014	2.00pm	38
Ozzy	19/11/2014	5.00pm	43
Oswald	18/11/2014	6.00pm	40
Otto	24/11/2014	4.00pm	37
Odysseus	18/12/2014	10.00am	31
Oliver	27/11/2014	10.30am	40
Omar	26/11/2014	2.00pm	49

APPENDIX 14: Cisco approval to conduct research

RE: Approval for field research needed

David Loy (dloy) 13 May 2014 4:27 pm

To: Iain Rolfe (irolfe)

RE: Approval for field research needed

DL

Approved

From: Iain Rolfe (irolfe)
Sent: Tuesday, May 13, 2014 4:26 PM
To: David Loy (dloy)
Subject: Re: Approval for field research needed

Hi David

Just need you to reply with "approve".

There is no cost for this to the organisation and no confidential information will be captured.

Cheers
iain

From: Iain Rolfe <irolfe@cisco.com>
Date: Thursday, 8 May 2014 10:40 am
To: "David Loy (dloy)" <dloy@cisco.com>
Subject: Approval for field research needed

Hi David

Cisco ethics & the research office have delegated approval for my research to you (my line manager). Can you reply with an approval so I can move forward?

I am summarising the key points so they are captured.

- I am doing a PhD on Business Models through Macquarie University.
- I am at the stage of doing field research which will be predominantly based around an interview format.
- I am doing a case study on two of Cisco's business models [the case structure is attached in the document]
- I intend to interview 7 executives [a draft list also in the document].
- I also intend to interview 10 front line employees.
- My interviews will regard how Cisco's business models adapt to their environment [draft questions are also in the attached word document]
- I have checked the ethics checklist and followed the process to find no issues arise.

Thanks so much,

Iain

CISCO

Iain Rolfe
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Cisco.com

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http://www.cisco.com/web/about/doing_business/legal/cri/index.html

APPENDIX 15: Macquarie University ethics approval

Office of the Deputy Vice-Chancellor (Research)
Research Office
C5C Research HUB East, Level 3, Room 324
MACQUARIE UNIVERSITY NSW 2109 AUSTRALIA

Phone **+61 (0)2 9850 7850**
Fax +61 (0)2 9850 4465
Email ethics.secretariat@mq.edu.au

12 August 2014

Dr Lars Groeger
Macquarie Graduate School of Management
MACQUARIE UNIVERSITY
NSW 2109

Dear Dr Groeger

RE: *Reconceptualising business models in a complexity paradigm as complex adaptive systems*

Thank you for submitting the above application for ethical and scientific review. Your application was considered by the Macquarie University Human Research Ethics Committee (HREC (Human Sciences and Humanities)) at its meeting on 27 June 2014 at which further information was requested to be reviewed by a subcommittee.

The requested information was received with correspondence on 21 July 2014 and 6 August 2014.

I am pleased to advise that ethical and scientific approval has been granted for this project to be conducted at:

- Macquarie University

This research meets the requirements set out in the *National Statement on Ethical Conduct in Human Research* (2007 – Updated March 2014) (the *National Statement*).

Details of this approval are as follows:

Reference No: 5201400606

Approval Date: 12 August 2014

The following documentation has been reviewed and approved by the HREC (Human Sciences and Humanities):

Documents reviewed	Version no.	Date
Macquarie University Ethics Application Form	2.3	July 2013
Correspondence from Dr Lars Grodger responding to the issues raised by the HREC (Human Sciences and Humanities)		Received 21/07/2014 & 6/8/2014
Appendix B: Research to be Undertaken Outside Australia		
Calendar Invite		
MQ Participant Information and Consent Form (PICF) entitled Complexity & Adaptability in Business Roles	1	21/07/2014
Interview questions and guide		

1

This letter constitutes ethical and scientific approval only.

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the *National Statement,* which is available at the following website:

http://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research

2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol.

3. All adverse events, including events which might affect the continued ethical and scientific acceptability of the project, must be reported to the HREC within 72 hours.

4. Proposed changes to the protocol must be submitted to the Committee for approval before implementation.

It is the responsibility of the Chief investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the Ethics Secretariat on 9850 4194 or by email ethics.secretariat@mq.edu.au

The HREC (Human Sciences and Humanities) Terms of Reference and Standard Operating Procedures are available from the Research Office website at:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics

The HREC (Human Sciences and Humanities) wishes you every success in your research.

Yours sincerely

Dr Karolyn White
Director, Research Ethics & Integrity,
Chair, Human Research Ethics Committee (Human Sciences and Humanities)

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research* (2007) and the *CPMP/ICH Note for Guidance on Good Clinical Practice.*